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MACHINE FOR FIXING THE THREADS OF FABRICS.

The machine shown in the accompanying engraving is designed to effect one of the principal operations that have to be performed before the dyeing and finishing of cashmere merinos. The object of fixing is to render stable each filament composing the fabric, so as to keep the threads of the warp, like those of the woof, in the position that has been given them in weaving, and to prepare them to undergo the successive operation without the fabrics fraying or breaking. It is a moist finishing performed at a temperature equal to that which the fabrics will again have to withstand. In weaving, the threads of the woof, in crossing those of the warp, assume a wavy form that results solely from the tension that the latter have received. If a thread of the woof be removed from the fabric it will imperceptibly tend to assume its original form. It results from this that if the operations of dyeing were proceeded with before the fabric had been submitted to fixing, the woof threads would become easily displaced and form frays. In the second place, as manufacturers of fabrics size the warp threads so as to give them greater firmness, it is necessary before proceeding to the fixing to remove this dressing, which exists in the proportion of 8 to 10 per cent, and which dissolves in water raised to a temperature of 40° to 50°.

Fixing, then, consists of two very distinct operations: (1) the removal of the sizing, which is done with water heated to 40° or 50°; and (2) fixing, properly so-called, which is performed with water raised in this case to a temperature varying between 70° and 80°.

The new machine under consideration permits of performing the work continuously, and of obtaining a uniform treatment of the fabrics as well as a complete fixing of all the fibers. It advantageously replaces those old manipulations that were attended with a great expense, due to the manual labor required; for the results there all depended upon the surveillance and the intelligence of the workmen.

The machine consists of two roll vats, each containing a rotary apparatus that carries rollers designed for receiving the woven pieces. The first vat, which serves for unsizing, is heated to the temperature requisite for dissolving the dressing and gelatine with which the warp threads had been sized. The liquid contained in this vat is quite quickly saturated, and is renewed twice a day. One of the lower cocks serves for emptying the first vat, which is afterward partially filled with liquid from the other one. This transfer of liquid is effected by means of a connecting pipe placed between the two tanks. The remainder of the filling of the first vat is done with ordinary water, to which has been added carbonate of soda to soften it. The water in the second vat is likewise heated to the temperature indicated above; and it is in this vat that the fixing is actually effected.

The rotary apparatus in each vat consists of two wheels mounted upon a common axle, and carrying between them, at their periphery, six rollers for receiving the fabrics. Each of these latter, on winding on the roller arranged for it, passes through a device designed to keep it taut and regular. As soon as one roller is entirely surrounded, the large wheels are caused to move forward a sixth of their circumference by means of handles, thus carrying the full roller into the liquid and presenting an empty one to be wound.

Each of these rollers is furnished at its extremities with small screw-brakes, which prevent the rotation of the axles during the immersion of the fabric in the liquid, and which give a certain tension to the fabric when it is passing from the first into the second vat, or from the latter to the squeezer. Rotary motion is transmitted to the receiving roller by means of a driving gear, acting progressively, and of a coupling sleeve. These mechanisms also actuate the roller of the second vat, through the medium of an endless chain.

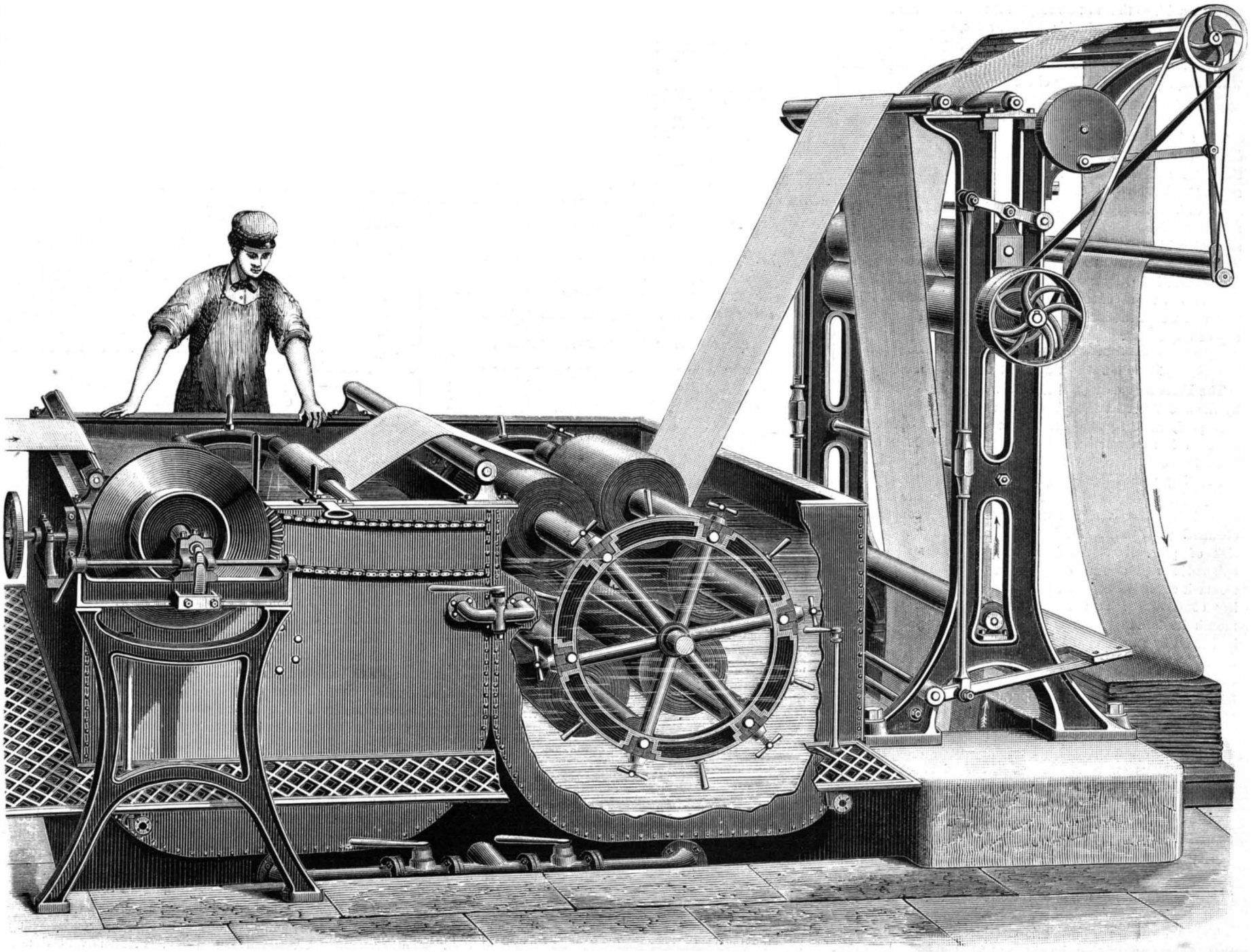
On leaving the first vat, to pass into the second, the fabric passes over a guide-roller, for which there may be substituted a widening bar or a stretching cylinder.

A maneuver similar to the preceding is performed in the second operation; so that, counting five minutes for the winding of a piece, the latter afterward remains for thirty minutes in each of the vats before being carried toward the squeezer.

The rollers are arranged for the reception of two pieces of goods of 100 meters each in length, but experience has shown that it is preferable to treat but one piece at a time. In this way there are prevented any irregularities that might otherwise occur in the selvages.

On its exit from the second vat, each piece descends into a reservoir containing tepid water, and afterward passes between the squeezing rollers of the drying apparatus. One of these rollers has a copper surface and the other is covered with India-rubber. The requisite amount of pressure is given them by means of a pedal at the base, connected by levers with the parts above. It varies according to the nature of the fabrics and the degree of dryness that it is desired to obtain.

When the first piece begins to leave the squeezers, the operation proceeds afterward in a continuous manner. Thus, during the winding of a piece over the roller located in front, the back roller unwinds, and its fabric then winds about the first roller of the next tank. At the same time,



MACHINE FOR FIXING THE THREADS OF FABRICS.

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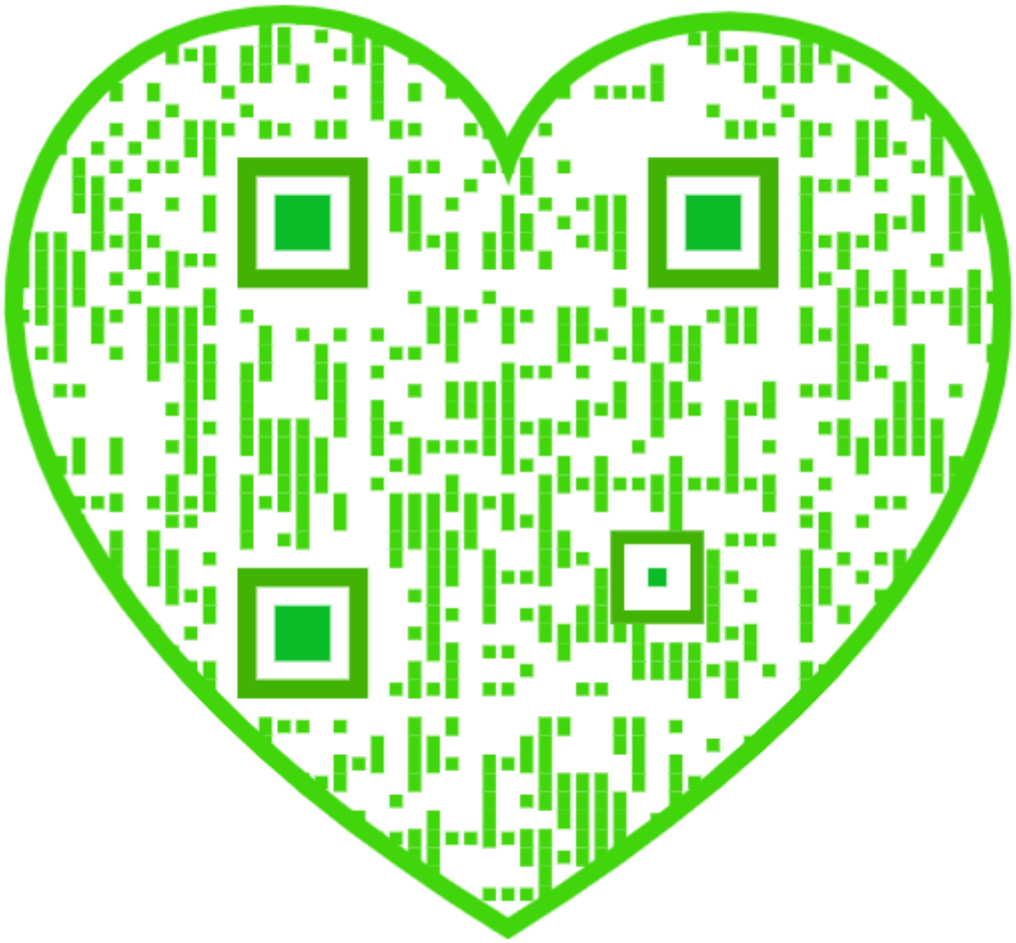

the fabric on the very last roller disengages itself, passes into the reservoir of tepid water, and then goes to the squeezing apparatus.

The mechanical movement of the folding machine draws the fabric on to the table, where it is properly arranged in folds, and from whence it is next taken to undergo the operations of scouring, rinsing, mordanting, and dyeing.

The same machine, arranged with perforated rollers and a pump for the circulation of liquid through the fabric, serves likewise for the ungumming of silks and the rinsing and scouring of cotton and woolen fabrics.—*Revue Industrielle.*

Hints to Swimmers.

When a swimmer gets chilled the blood ceases to circulate in the fingers, the finger nails become a deathly white color, the lips turn blue, and should he persist in staying in the water after these symptoms develop he is sure to have cramps. So long as the swimmer can discern spots on his finger nails he knows that his blood is in good order, and that he is safe and free from chills. I have been remarkably free from chills, and feel most at ease when in the salt water under a hot sun. Salt water seems to attract the heat, and, no matter what the temperature of the water, under these circumstances I feel warm. I have on some occasions swum so as to keep my body under water, but even in such instances on coming out I have found my back and limbs blistered. This shows the penetration of the heat from the rays of the sun on the water. On one occasion, since I was here last, I swum for £400 at Scarborough, staying in the water seventy-four hours. I use a preparation of porpoise oil, which I rub all over my body, even my face. The oil fills up the pores of the skin and keeps the salt water from permeating my vitals. All professionals now use oil.—*Captain Webb, in Boston Herald.*

Albumen in Cows' Milk.

Dr. Schmidt, Mülheim, has been investigating the nitrogenous bodies in cows' milk, about which so much diversity of opinion has hitherto prevailed. He says that three albuminoid substances are regularly present in the milk, viz.: caseine, albumen, and pepton. The average of seven analyses gave 2·43 per cent of caseine, 0·38 per cent of albumen, and 0·13 per cent of peptons. Under certain circumstances the amount of albumen may increase until it equals that of the albumen. The pepton is formed from the caseine by a fermentative process; this ferment is destroyed by a boiling temperature, but its activity is not destroyed by salicylic or carbolic acid, so that in this respect it resembles the ferment that digests the albuminoids. Since milk, on long standing, may lose 10 per cent or more of its caseine by its conversion into peptons, it should be made use of as fresh as possible when employed for making cheese.

Sulphocyanide of Barium.

The adulteration of this substance is carried to such a degree that in some French specimens only 80 per cent of the pure salt, $Ba(SCN)_2 2H_2O$, was found, the impurities consisting largely of barium chloride.

Dr. J. Tscherniac gives the following simple test. The sulphocyanide of barium is completely soluble in absolute alcohol, while all the barium salts that can be profitably employed for adulteration are insoluble in it, or very slightly so. Hence it is only necessary to shake a sample of the salt with two or three times its weight of alcohol, and then wash, dry, and weigh the insoluble residue, to determine the quantity of impurities.

Remarkable Surgical Operation.

The Paris Academy of Medicine was yesterday informed by the operator that the young man on whom an operation was performed for the extraction of a spoon from his stomach has completely recovered from the effects of the hazardous operation, and is now enjoying his usual health. Interesting particulars are given of this operation, which was performed by Dr. Felizet. By the use of the Faucher tube introduced through the mouth the stomach was cleansed prior to the novel operation, which prevented the risk of peritonitis. An incision was then made in the epigastric region. In order to render the coat of the stomach easily accessible, M. Felizet employed the following contrivance: To the end projecting from the man's mouth he fitted a spherical vessel containing ether. This he heated by submersion in water of sixty degrees temperature. The ether vapor rushing through the tube filled the stomach, which, becoming distended, was brought forward to the wound effected by the operator's knife. The spoon was thus readily found and extracted. It measured over nine inches. It had been accidentally swallowed by the man, a waiter at a café, in the attempt to imitate the feats of the famous sword-swallower.—*Paris Correspondence of the London Standard, October 7.*

THE northernmost place in the world where rye and oats mature is at Kengis, in the Swedish province of Norrbotten, forty-nine miles to north of the Polar circle, whereas the northernmost spot where corn is grown is at Muoniovara, ninety-eight miles to north of the circle.

THE Bell patent would, it is considered by those competent to form an opinion, be cheap at $10,000,000. The consolidated telephone interests of the United States are estimated at from $100,000,000 to $150,000,000.

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THE PAST YEAR'S WORK IN THE PATENT OFFICE.

The report of the work of the Patent Office for the fiscal year ended June 30, 1882, just submitted by Commissioner Marble, shows that there were received 27,622 applications for patents for new inventions; 854 for design patents; 407 for reissue patents; 737 for registration of trade-marks, and 442 for labels, a total of 30,062. There were filed during the year 2,455 caveats. The number of patents granted, including reissues and design patents, was 17,713. The number of trade-marks registered was 1,079; labels, 223; total, 19,015. The number of patents withheld for non-payment of final fee was 1,637; patents expired, 5,123. The receipts of the office from all sources were $930,864 14; expenditures (not including printing) were $651,719.50; surplus, $279,144.64.

The abridgment of United States patents was discontinued August 1 for lack of appropriations. The Commissioner asks that legislative action be taken to authorize the office to compel the attendance of witnesses to testify as to the use or sale of any invention before the two years' limit, when an application for a patent therefor is pending. He also expresses the opinion that the terms of patents issued should not be rendered uncertain by the operation of the laws of any foreign country, nor by the failure of the patentees or their assignees to do what such laws require. If the patent for an invention which has been first patented in a foreign country should be limited in its term, he thinks that a definite term should be fixed, and a time within which application must be filed in the Patent Office after the issuance of such foreign patent be prescribed. In view of the fact that the terms for which patents may be granted in foreign countries are shorter than that for which they may be originally granted in this country, he thinks that twelve years would be a proper term for patents where the invention has first been patented, or patent applied for, in a foreign country, and that the applicant should file his application within two years after the issuance of such patent or application therefor.

THE GARFIELD MONUMENT EXHIBITION.

Last summer Congress gave the Society of the Army of the Cumberland permission to use the rotunda and adjacent halls of the United States Capitol from November 25 to December 3, for a bazaar and reception, for the purpose of raising funds to aid in the erection of a monument in Washington to the memory of the late President Garfield.

The propriety of making a show house of the national capitol may be questioned; but since it has been allowed, it is to be hoped that the exhibition will be as commendable as its object and worthy of its unparalleled housing.

The Board of Directors comprises representatives of the executive, legislative, and judicial branches of the Government, the army and navy, the Society of the Army of the Cumberland and the citizens of the District of Columbia, assisted by State boards of commissioners. The exhibits will be shown in eight groups and sixty-four classes, and awards will be made according to the rules observed at the Centennial Exhibition of 1876. Applications for space for exhibits (loaned or donated) must be made before November 1; and the exhibits must be placed in the hands of the directors before November 11. Donated exhibits will be sold for the benefit of the monument fund.

The exceptional conditions under which the National Bazaar, Industrial and Art Exposition is to be held would seem to make especially inviting the opportunity offered to manufacturers and others to exhibit their wares. The headquarters of the Board of Directors are at the Ebbitt House, Washington.

QUEER DOINGS IN OIL.

The summer of 1882 must pass into history as having witnessed the most memorable doings in the annals of the petroleum trade of Pennsylvania. In the SCIENTIFIC AMERICAN for July 22, 1882, reference was made to the results which followed the opening, in May, of the new oil deposits in Warren county, Pennsylvania. A most ruinous policy was followed by the producers, who succeeded in obtaining a lease upon the prolific sand rock. Five wells to the acre were pierced in the heart of the rock, and when signs of weakness were noted in the flowing of these wells, nitroglycerine torpedoes, of 40 quarts each, were exploded in the bottom of the well. The latter, in a number of cases, yielded when first struck 2,500 barrels every twenty-four hours; at least one produced 3,000 barrels, and a 500 barrel well was regarded as a small affair. Other and older oil regions were comparatively deserted, and in August last the new field, from less than 200 wells, was yielding 25,000 barrels of oil daily, bringing up the production of the entire oil regions to the unparalleled figure of 105,000 barrels daily, and sending the price below fifty cents per barrel. But it was the fable of the killing of the goose that laid golden eggs modernized and enacted on a stupendous scale.

Early in September, after the best wells had been "shot" by torpedoes repeatedly, they suddenly ceased producing in a way that caused a revulsion of feeling and intense excitement among all interested in producing petroleum. By October 1st the daily production had, in all the regions, fallen off nearly 25,000 barrels, and for the first time in five years, production and consumption nearly approached each other, namely, 70,000 barrels per day. Prices advanced, and the excitement at the Oil Exchanges of Pittsburg, Oil City, Titusville, Bradford, and New York City was so great,

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and the activity so intense, as to be phenomenal. The sales at Oil City during September reached 153,000,000 barrels. On one day alone, Sept. 18, the sales were over 11,000,000 barrels. Meanwhile 70 wells in the choicest territory ceased producing, and early in October the new territory was not yielding over 5,000 barrels daily, and the price had mounted to one dollar. The records of the oil trade, show but feeble parallels to last summer's development, and the rise and decline of the Cherry Grove, Warren Co., Pa., regions is a unique bit of oil history.

SPEED IN WAR VESSELS.

The French have lately launched a new turreted ironclad, the Arethuse, carrying four steel guns in her turrets, besides a battery of twelve smaller guns. Her engines are intended to develop as high as 4,200 horse-power, giving her an average sea speed of 16 knots an hour. Her length is 296 feet 8 inches between perpendiculars, and her displacement about 3,360 tons.

It is but a few months since our Naval Advisory Board recommended the building of unarmored cruisers to have a speed of 15 knots. The inability of such cruisers to cope in speed with unarmored vessels like the Arizona and the Alaska, which would be promptly converted into cruisers in case of war with a commercial power, was pointed out the moment the recommendation of the Advisory Board was submitted.

In the Arethuse the proposed cruisers would meet an antagonist which they could as little fight as run away from with any hope of success; and the naval constructors of other nations are not likely to rest until still higher speeds are attained by ironclads, as they have already been by lighter vessels.

It would be consistent with the general conduct of our naval affairs to go on with the building of 12 knot cruisers, admirably appointed to secure the comfort of officers on official picnics and practically useless in time of war; but it may be questioned whether the people, who have to foot the bills, will be at all pleased to have it done.

If the navy department cannot design or get designed a cruiser capable of making or approaching twenty knots, the reconstruction of our antiquated navy had better be postponed until the department itself has been reconstructed.

MORE RAILROAD INVENTIONS WANTED.

With the rapidly increasing traffic on American railroads there is a demand for greater facilities for loading and unloading freight. It would seem that an improvement in the construction of warehouses might be made that would render the rapid handling of heavy freight an easy matter, as compared to the present clumsy and inconvenient structures.

There is hardly any country station but has more or less heavy freight to handle, and frequently much trouble is experienced for the want of proper appliances for the work. Of course at terminal stations something has been done by way of cranes and derricks, hoisting machinery, etc., but even the best regulated warehouses are open to radical improvements in apparatus and appliances for moving heavy as well as light and bulky freight. This is worth the study of inventors.

There is also a chance for improving platforms, so that moving goods from the cars to the warehouses may be an easy matter, without the use of the ordinary trucks.

Another thing that interferes with the rapid handling of freight is the location of the doors of freight cars midway between the ends. Ordinarily, this is the proper place for the door, and is preferable for a single door. But if a car were so constructed that goods could be loaded in any part of its length, it would certainly be more convenient than with the central door. This might be accomplished by constructing the car with a system of slide doors the entire length of its sides, so that a car might be loaded in sections and much sooner than if loaded from the middle. This would also facilitate unloading. Appliances for loading and unloading goods from platform cars are nearly satisfactory, but may be improved.

This is an inviting field for the inventor. But if any American inventor would reach the top of the ladder of fame at a single bound, let him produce a station indicator that will inform railway passengers where they are when they arrive at a station. How well the human machine fails to do this is well known by every railway traveler. For a brakeman to speak the name of a station so that any human being can understand it seems to be one of the lost arts, and it remains for the inventor to produce a substitute to perform this duty. This has already been accomplished so far as "braking" is concerned. Now let us have a *reliable* station indicator.

Then there is a want of a humane invention to prevent people being caught in frogs and switches, guard rails, etc. Hundreds of people are killed or maimed every year by being caught in the "boot-jack" portion of frogs and held fast, and run down by cars or locomotives. This trap is a peculiar one. A person slides his foot into the wedge-shaped opening, where it is held in horizontally, while the rail heads prevent his lifting his foot vertically, and before he can extricate himself he is a mangled corpse. Some devices have been tried to prevent these horrors, but none is effective. It will not do to fill this space with any rigid substance, for the wheel flanges must have room. Some yielding substance, as a spring, may be made to fill the space, so as to keep the feet out of the trap and yield to the pressure of wheel flanges. This is a serious evil, and there is no doubt that the railway community will reward the inventor who will produce an effective remedy.

W. S. H.

THE EDUCATIONAL WANT OF THE SOUTH.

It is not many years since the young men of the South were studiously instructed to despise mechanical employments. The "greasy mechanic" of the North was an object of Southern scorn, and the true Southerner was expected to thank God that few of that class were ever likely to venture south of Mason and Dixon's line.

An amazing and most encouraging change has been wrought in the popular sentiment of the South on this score during recent years. Factories are springing up; undeveloped resources are being turned to use and profit; and almost everywhere the feeling is coming to be, if it has not already become, one of respect for and desire for a rapid development of mechanic arts. As an expression of this feeling we have seen nothing more significant than a recent article in the Atlanta (Ga.) *Constitution*, from which the following is eminently quotable. It is a lesson which young men of the North as well as of the South may profitably take to heart:

"We have an over-supply of clerks, lawyers, and politicians, and we always will have; but we are sadly deficient in men whose hands are cultivated as well as their brains. We lack intelligent mechanics and civil engineers, and foremen, and managers of machinery. If we gather enough money to start a factory, we have to send to other States to get men competent to guide the machinery and conduct the inside operations of the factory. If we build a railroad, we must at the outset import engineers, and afterward men skilled in operating a railroad.

"This is all wrong. The young man of the future in the South—the best in the land—should study, as soon as he leaves school, some department of manufacturing. He must first, of course, make himself a skilled mechanic—learn a trade, in other words—and he need not and should not dislike the phrase. It is certainly as honorable and as pleasant to set a horse's shoe as to pettifog a case in a justice's court, or sell ribbons in a retail store, or serve in any other half paid and precarious employment. We must get rid of the sham gentility that despises labor, and especially labor in which brain and skill are harmoniously and effectively united. If the South is to become independent—if her industrial interests are ever fully developed, her young men must abandon old time notions of labor, and prepare themselves to take charge of matters that are now necessarily the spoil of strangers. The best and most inviting places in the southern country now go, as they do in Mexico and Egypt, to skilled men from other and more sensible States. The better the boy is educated, the better mechanic, or superintendent, or engineer, he will make. The high school is as useful to the future mechanic as to the future lawyer or merchant. All boys need all the schooling they can get; but, after they leave school, let them turn to industrial rather than professional avenues.

"To effect this we need, as in all other reforms, a change in public sentiment. We need a sentiment that will condemn the folly of the past in this respect. We need a sentiment that will recognize the fact that the great industries furnish the best field for the young man who has a career to make—that in them is to be found both good wages and the most promising and desirable employment that the land affords. If we can once secure such a public sentiment, we can safely trust the remainder of the problem to the courage and good sense of the young men of the South."

CHEAPER MEAT FOR NEW YORK.

The shipment of dressed meat from Chicago to this city continues, and a sharp fall in prices has resulted. Other and larger firms have taken up the business, and the entire slaughtering interest of this city is threatened with extinction, together with several trades depending largely if not wholly upon it—hide salting, glue making, soap making, and the manufacture of oleomargarine. The public gain in lower prices promises to much more than offset these losses.

It is said that several of the largest slaughterers of this city have resolved to transfer their slaughterhouses to Chicago, and ship their dressed meat here for sale, as it is not thought possible to bring western cattle here to kill in competition with the sellers of beef dressed in Chicago. The expense of killing in Chicago is no greater than here, while the hides, fat, and offal are worth about the same in both markets, the advantage, if any, being with Chicago. A car that will accommodate fifteen live steers will carry nearly three times as many dressed cattle; and the saving in shrinkage and loss through accident is very great. The time of transmission is reduced to forty hours. If the railway companies do not interfere by putting up the rates for dressed meat the new venture cannot fail of success. Hitherto from eleven to thirteen thousand cattle have been slaughtered in New York every week. For three years or more Chicago killed beef has been regularly shipped through this city to the London market, arriving in good condition.

Professor Haeckel in Ceylon.

"My frugal dinner at an end, I usually took a solitary walk on the shore, or delighted my eyes with the sight of the illumination of the palm woods by myriads of fire-flies and glow-worms. Then I made a few entries in my note book, or tried to read by the light of a cocoanut oil lamp. But I was generally quite tired enough to go to bed soon after nine o'clock, after another careful shaking of the clothes for the expulsion of scorpions and millipeds.

"The great black scorpion (nearly a foot long) is so common in Ceylon that I once collected half a dozen in the course of an hour. Snakes exist also in great numbers. Slender green tree snakes hang from almost every bough, and at night the great rat snake (*Coryphodon blumenbachii*) hunts rats and mice over the roofs of the huts. Although they are harmless and their bite not poisonous, it is by no means a pleasant surprise when one of these rat snakes, five feet long, suddenly drops through a hole in the roof into one's room, occasionally alighting on the bed.

"On the whole, however, my nights in Belligam were but little disturbed by animal intruders, although I was often kept awake by the howling of jackals and the uncanny cry of the devil bird (a kind of owl, *Syrnium indrani*) and other night birds. The bell-like cry of the pretty little tree-frogs which make their dwelling in the cups of large flowers, acted rather as a slumber song. But I was far oftener kept awake by the whirl of my own thoughts, by the recollection of the many events of the past day, and the anticipation of that which was to come. A brilliant succession of lovely scenes, of interesting observations, and varied experiences mingled in my brain with plans of fresh enterprise and new discoveries for the morrow."

A Poison for Tubercular Bacteria.

A paper was recently communicated to the Paris Académie des Sciences, by M. De Korab, on the action of helenine on the bacteria of tuberculosis. The facts mentioned deserve notice, although we fear that the hopes suggested are too bright to be realized. The bacilli were cultivated in bovine blood serum, which was daily heated for a week to effectually sterilize it, and was then coagulated by a temperature of 65° C. A guinea-pig having been rendered tubercular by inoculation and inhalation, small tubercular masses were taken from it, introduced into ten tubes containing the tubercular serum, and the tubes plugged after some helenine had been poured into three of the tubes. All were kept at a temperature of 37° C. for a week, and at the end of that time inoculation experiments showed that the organism in the tubes to which the helenine had been added no longer caused tuberculosis, which was readily produced by the contents of the other tubes.

Railway Photography.

Instantaneous photography, in its more familiar aspect, supposes motion of the objects photographed; but another form of it is that in which it is the camera, more especially, that has motion of translation, as in photographing from balloons or trains. The practicability of photographing landscapes from the window of a train running at a rate of even forty miles an hour has been recently proved by Dr. Caudèze, who uses what he calls a gyrograph for the purpose. The apparatus comprises a copper tube similar to that which carries the lenses in ordinary cameras, but the lenses are placed on opposite sides parallel to the axis. Within is a shutter similar to the box of a stopcock; it presents two quadrangular apertures, which, according to the position of the shutter, do or do not let pass the light rays in making a quarter of a turn. This rotatory movement is obtained by means of a spring liberated from a catch. An exposure of only one one-hundredth of a second may be had. With a little practice wonderfully distinct views, it is said, can be obtained with the apparatus.

The New York Elevated Railroads amenable for Damages to Property.

Five years ago, Rufus Story, of this city, sued to restrain the New York Elevated Railroad Company from constructing and operating its road through Front street, opposite his premises. The action was tried in the Court of Common Pleas, in October, 1877, and resulted in a judgment for the railroad. The case was carried to the Court of Appeals, and the final arguments were made last June in Saratoga, John E. Parsons and William M. Evarts appearing for Mr. Story, and David Dudley Field for the railway company.

The Court of Appeals rendered its decision Oct. 17, reversing the decision of the lower court, and practically declaring that the owners of property along the lines of the elevated roads have a right to recover damages where their property has been injured in value by the construction and operation of such roads.

Fatal Accident in Splicing Electric Conductors.

The killing of a lineman while splicing an electric light wire in this city was noticed a few weeks ago. A correspondent, "A. P.v. R.," writes us from Vienna that a similar accident occurred at Triest, September 15. The Industrial Exhibition Building there had been partially unroofed by a storm, and in the fall of a pavilion the wires leading from a dynamo machine to lamps used in lighting the park around the exhibition building were broken. The engineer in charge, without stopping the dynamo, went to repair a broken connection, and, on grasping the two ends of the severed wire, received a shock that killed him. The victim was accounted a capable electrician, and was one of the firm of engineers who had introduced the lights and exhibited electric lamps and machinery in the exhibition.

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PLANE GUIDE.

This device, which may be used on an ordinary work-bench, is particularly adapted for use with the dado plane in cutting gains transversely or obliquely, and is so constructed that, after one piece is gained, any desired number of duplicates may be made without being previously "laid out."

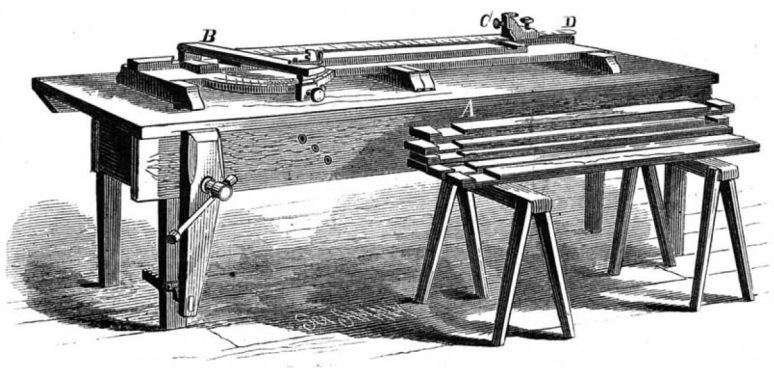
The plane guide—which may be eight or ten feet in length—is placed on an ordinary work-bench for use. An adjustable guide, B, is hinged at the rear to the pivoted bar, A, and capable of being opened or raised vertically to facilitate the placing and removal of the stuff to be worked. The guide can also be adjusted to suit material of different thicknesses.

C is a sliding gauge, which may be set at any desired position on the graduated plate or rule, D, and serves to mark the length between the gains to be cut.

In operation, the guide is opened to a vertical position, the material placed in position, the guide closed down and fastened, thus securing the material in position and furnishing a guide to direct the plane in cutting the groove. The guide, in connection with the pivoted bar, may be set at any desired angle and secured by the thumb-screw.

With this device, window frames, door frames, etc., may be accurately gained in less time than is required to lay them out for gaining in the usual manner with saw and chisel; besides, the work may be done by an unskilled workman.

When not in use, the device, being hinged at H, may be folded up and placed in any convenient place in the shop. Further particulars may be obtained by addressing the patentee, Mr. Wm. H. Stinson, Scandea, Kansas.



STINSON'S ADJUSTABLE DADO PLANE GUIDE.

Artificial Gems.

P. Weiskopf gives in the *Diamant* the following formulæ for the frit or mass used in Bohemia for making imitations of some of the precious stones:

Imitation agates.—10 kilos quartz, 17 kilos red lead, 3·2 kilos potash, 2 2 kilos borax, and 0·1 kilo arsenic. The quantity of chloride of gold added is equal to that obtained from 0·4 of a ducat.

Agate glass.—10 parts of broken glass is melted, and to it are added 0·15 part suboxide of copper, the same quantity of the oxides of chromium and of maganese, 0·02 part each of oxide of cobalt and nitrate of silver, 0 01 oxide of uranium 0 4 red argols, 0·3 part bone meal. Each oxide is added alone and at intervals of ten minutes. After heating the mixture for an hour, 0 3 or 0·4 part of fine soot is put in.

Red marble.—80 parts of sand, 40 of potash, 10 of lime, 2 of table salt, 1 of saltpeter, and 0·1 of arsenic. The mixture is melted, and then 25 parts of suboxide of copper and 1 part of saltpeter mixed in

Artificial turquoise are made in Paris and Vienna that cannot be distinguished by external appearances from the natural product, and when artistically made can only be distinguished by means of the file, being usually softer. They are made from phosphate of alumina and phosphate of copper mixed together and subjected to hydraulic pressure. Even in chemical composition it resembles the natural mineral, which is a hydrated phosphate of alumina with 2 per cent of oxide of copper.

Artificial Vanilline.

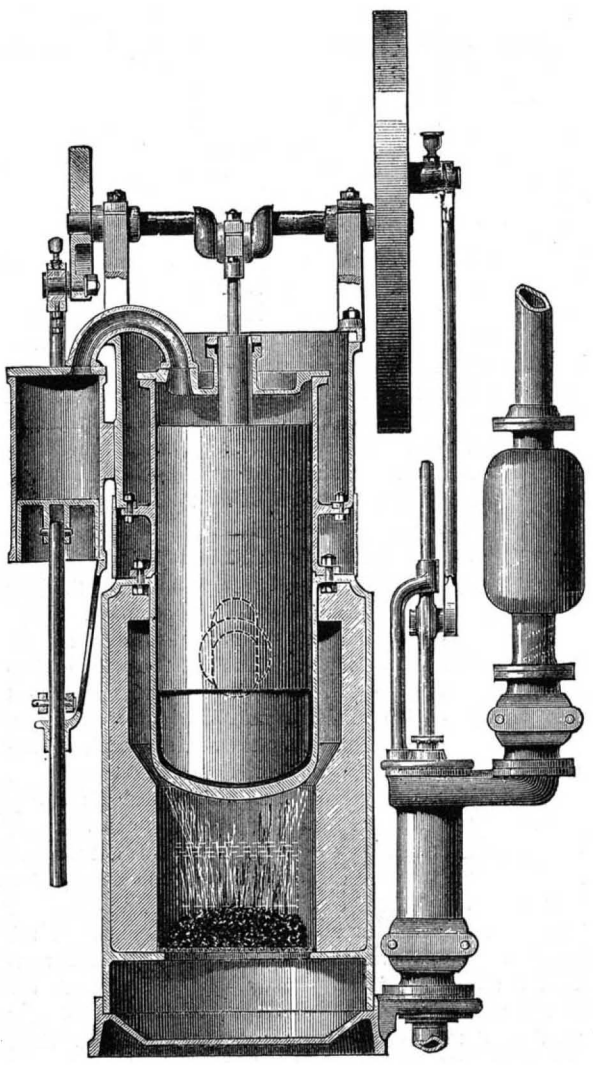
Some six or seven years ago, the discovery of a method for the preparation of artificial vanilline, the odorous principle of the vanilla bean, was announced. Its production as a commercial article was soon begun, and high hopes were entertained that it would be a financial as well as a scientific success, but as yet its use is very limited and its price very high. Several methods for its production have since been discovered and patented; the most recent is the subject of a patent taken by Meister, Lucius, and Brüning. Although a very simple one, the names of the products made use of enjoy the advantages of long names. The meta form of amido benzaldehyd is first converted into the diazo compound, in the usual manner, and by decomposing with water it forms meta oxyl-benzaldehyd. This is nitrated and methylated, and thus converted into para-nitro-meta-methoxyl-benzaldehyd, $C_6H_3.NO_2.OCH_3.CHO$. By reducing the nitro group to an amido group, converting into a diazo compound and decomposing that with water, they obtain vanilline, $C_6H_3.OH.OCH_3.CHO$, the full scientific name of which is para-oxy-meta-methoxyl benzaldehyde. Whether this new and *simple* process will be any more successful than those hitherto tried is doubtful, to say the least.

Tin in Colorado.

A promising discovery of tin is reported in a Denver, Colorado, paper. The lode is said to be situated in the American basin, on the lake fork of the Gunnison, in Hinsdale county, just beyond the San Juan county line, Col. A poor prospector commenced work on the mine in 1874. The ore is of two kinds—leaf tin and English or silver tin, carrying also fifty ounces of silver and five ounces of gold. The vein is 12 feet wide, and shows on the surface for 1,500 feet. The ore is pronounced by experts in Denver, Pueblo, and Washington the richest tin ore ever discovered in this country.

IMPROVED HOT AIR ENGINE.

The "vertical" hot air engines, it will be observed, differ from hot air engines that have already been introduced into the market in the arrangement of the cylinders. The air cylinder is placed outside the casing, offering thereby greater facilities for cleansing and lubricating, also for examining the different parts. This cylinder is fitted with a metallic piston, and the shape of the cylinder enables this type of engine to be made as compact as possible. The action of the engine may be described as follows: After the fire is made the retort becomes heated to a dull red heat. This rise of temperature expands the small amount of air inside, which then forces the piston in the air cylinder downward. After this expanded air has done duty, the displacer, which is actuated from the crank, forces the air which has been condensed against the cold sides of the top part of the cylinder back to the hot end of the retort. As the piston performs its stroke, due to the expanded air in the cylinder, a small air valve is kept closed by the pressure, but as the piston makes the return stroke a small valve on the top of the cylinder opens for a sufficient length of time to permit air to enter the cylinder to replace any which has been permitted to escape through any defect in packing; so that it will be seen that not only is it automatic in receiving the proper supply of air for expansion, but it is also automatic in its lubrication, for wherever this down stroke is made a small amount of oil is drawn into the cylinder for lubricating the metallic piston. The manufacturers claim in this type of hot air engine that the design admits of the engine being made much cheaper, as well as affording great facilities for examining, lubricating, and repairing, than is the case with any other hot air engine. It is being made in considerable numbers by Messrs. Bailey & Co., Salford, London.—*The Engineer.*



IMPROVED HOT AIR ENGINE.

DURING a recent tornado in Brewer, Me., a plank was blown with such force against a cistern with wooden walls an inch and a half thick, that the board penetrated some distance through the wall into the water. It was found that the board was wedged in so closely that the water did not leak, and the owner simply sawed the plank off, leaving the wall in the cistern all right.

Are Toads Poisonous?

In answer to this query, propounded by Mr. Herbert Brown in a recent number of *Knowledge*, a decided affirmative may be returned. The toad *is* venomous, though not in the way that is implied by the general acceptation of that term, as is commonly believed. Nothing can be more harmless than the bite of the common toad—if it can be said to bite, for it has no teeth. But the glands contained in the papillæ and rugosities of the skin covering the back, and especially those which can be plainly seen in the form of two bean-like eminences just behind the head, secrete a milky, highly acrid fluid, which is exuded profusely on irritation. Indeed, if it were not for this poisonous secretion, the poor toad would fall an easy victim to many enemies, having neither the agility of the frog or lizard to enable it to make its escape, nor the teeth and claws of other reptiles wherewith to defend itself. Cats, which are eager hunters of frogs for food, spit and foam at the mouth when they pick up the wrong batrachian by mistake, and are often affected in a similar manner to Mr. Brown's St. Bernard; frog-eating snakes, too, detect the difference, and will not take toads, as a rule. When a snake, greatly pressed by hunger, swallows one, it usually rejects it again immediately afterward, and not unfrequently dies. Those frogs which prey upon their own kind (as most frogs do) despise their ugly relative from an alimentary point of view; and, curiously enough, certain toads which devour frogs share the same antipathy to their race. Except with very small animals, the poison appears to act rather as a local irritant than a toxæmic agent; it has no effect upon the sound skin, but will cause any abraded surface to inflame to extensive ulceration, while great pain results from its application to the conjunctiva or internal mucous membranes. Any one who can overcome his repugnance to the creature sufficiently to put his lips or tongue against the skin of an angry toad will experience an intensely acrid taste; he should shut his eyes in making such an experiment, as the post-occipital glands sometimes emit their secretion in a jet. Mr. Frank Buckland quotes a case which occurred in Oxfordshire, where a drunken brute bit a toad's head off. Happily, his teeth went right through these glands, and his mouth and throat immediately became swollen and inflamed to such an extent that his life was in jeopardy for some hours. These characteristics are much more strongly marked in many of the tropical Bufonidæ. My giant toads (*Bufo agua*) used to swelter venom when they were taken in the hands in such abundance that it would pour off their backs and drip from them, before they became tame; and I was thus enabled to collect a large amount. This species feeds on rats, and it is possible that this copious exudation may serve to prevent their prey from biting them when seized by the leg, or otherwise awkwardly caught. I once put a "cribo" snake (*Dromicus fugitivus*) into a box with three of these toads for a single night, for lack of other accommodation; it was a fine, active specimen, five or six feet long, and its movements during the night so disturbed them that in the morning I found the floor of the box all awash with fluid. The snake was lying on its back, apparently dead; and, though it recovered somewhat on being plunged into a bath, it survived only a few days.—*Arthur Stradling, C.M.Z.S., in Knowledge.*

Photograph of an Explosion.

The United States Engineers recently photographed the explosion of a wreck, which was blown to pieces by submarine charges of dynamite, to ascertain, among other things, how long the spectacle really lasted. The result was exceedingly interesting. There were six cameras employed, and the instant of the explosion, as also the several instants when the exposures were made by shutter, were electrically timed by a chronograph.

A photograph taken one-tenth of a second after the explosion showed the vessel broken, and a column of water 70 feet high; a photograph secured 1·5 seconds after the instant of explosion showed a column of water 160 feet high; a third photograph, taken 2 3 seconds after, showed the column at its full height of 180 feet, while fragments of wreckage were in the air, but none had fallen to disturb the surface of the water; a fourth picture, taken 3·3 seconds after, showed the column falling, and the surface of the water disturbed; while a fifth photograph, secured 4·3 seconds after, showed that all was over.

Height of Buildings.

In the Insurance Cyclopedia, Mr. Walford mentions the Swedish law which came into force in 1875, and which prohibited the erection of buildings in cities and towns of a height more than five feet above the width of the street on which they are built. A wise precaution, says the *American Exchange*, to secure proper ventilation and avert the spread of conflagrations, and which somewhat qualifies Capt. Shaw's rule that the safety or saving of the individual ignited building is indirectly in the ratio of the height to area or cubic content under equal combustible conditions otherwise. This is part of the question, whether we shall in the future build *cities*, or continue, as in the past, to build capricious individual structures.

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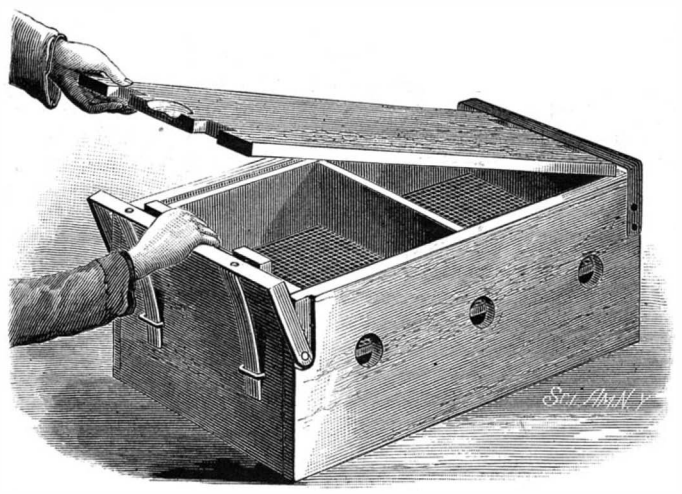
NEW BOX FASTENER.

The device shown in the engraving is designed for fastening lids on boxes without the use of screws or nails, and in such a way that the lid can be readily fastened or removed.

The lid fastening consists of a pivoted bail at one end of the box, to which springs are attached. These springs pass through staples on the end of the box, and press the bail over the end of the lid. The latter is provided with a series of tongues fitting into recesses and between tongues on the upper edge of the end of the box, the end of the box being provided on its upper edge with a spring, which presses upward and holds the lid up against the pivoted bail to prevent the bail from becoming loose.

To fasten the lid on the box, one end of the lid is passed under the fixed strap or band, and the bail on the opposite end is pulled outward, and the tongues at the end of the lid are pressed into the recesses in the upper edge of the end of the box. Then the bail is pushed back again over the tongues. The bail and the straps pass into recesses in the end, sides, and lid of the box, so that their surfaces will be flush with the surfaces of the box. Stamps of muslin or paper are secured on the lid and box to indicate whether the lid has been tampered with or not. This useful invention has been patented by Mr. William J. Baker, of Denver, Col.



BAKER'S BOX FASTENER.

Changes in Cruls' Comet.

Spectroscopic observations of the great comet, made by Commander Sampson, at the Naval Observatory, Washington, October 15 and 16, showed the spectrum to consist of three bands. The brightest band was in the middle of the green, nearly corresponding to the "B" lines; the second was in the orange yellow; the third, at the middle of the blue. The middle band was very bright, and sharply defined on the least refrangible side. The other two bands were of about equal brightness, but were much fainter than the middle band. Like it, their brightest portions were near the least refrangible side. No band sharply defined on both sides could be made out.

This spectrum is quite unlike the one observed when the comet was nearer the sun: a spectrum bright and continuous, with many bright bands, among which the sodium bands were particularly prominent. In the spectrum of October 15 and 16 there was no trace of the sodium band.

It was found that when the brighter portions of the bands were removed as far as possible from the field of view, the fainter portions were seen to extend themselves into an almost continuous spectrum. When the tail of the comet near the nucleus was examined, it was found to consist of a faint continuous spectrum, without any bright bands. The explanation of this great change in the spectrum is that when the comet was first examined just after it had passed the sun, the continuous spectrum was due to reflected light, while the bright bands were due to the incandescent vapor formed by the intense heat of the sun. The comet has now so changed its position with regard to the sun that the amount of reflected light has greatly diminished, and the comet itself has greatly cooled after its hot bath in the atmosphere of the sun. The beautiful silvery appearance of the comet is attributed to the preponderance of green light which it emits, as shown by its spectrum.

To account for the apparent separation of the nucleus of the comet into three or more parts on several days with subsequent consolidations, the hypothesis has been advanced that the nucleus is not a single body, but is made up of a cluster of independent parts with a motion among themselves. The discovery by Dr. Schmidt, at Athens, October 8, of a small comet near the great comet, and pursuing the same general course, tends somewhat to confirm the hypothesis of a broken or "cluster" nucleus.

A Medical Case for Railways.

The Pennsylvania Railroad Company has had prepared for carriage on each locomotive of the company, a box of appliances to be used in case of accidents. The box contains: one rubber compress, one package of absorbent cotton, six rolls of bandages, and one pyramid of pins. A label on the box tells how the outfit is to be used, and directs that it must always be kept up by immediate requisition for any article needed. This outfit is obviously intended mainly to meet necessities arising from accidents to trainmen in the ordinary course of events; yet it might prove very serviceable to injured passengers in case of large disasters.

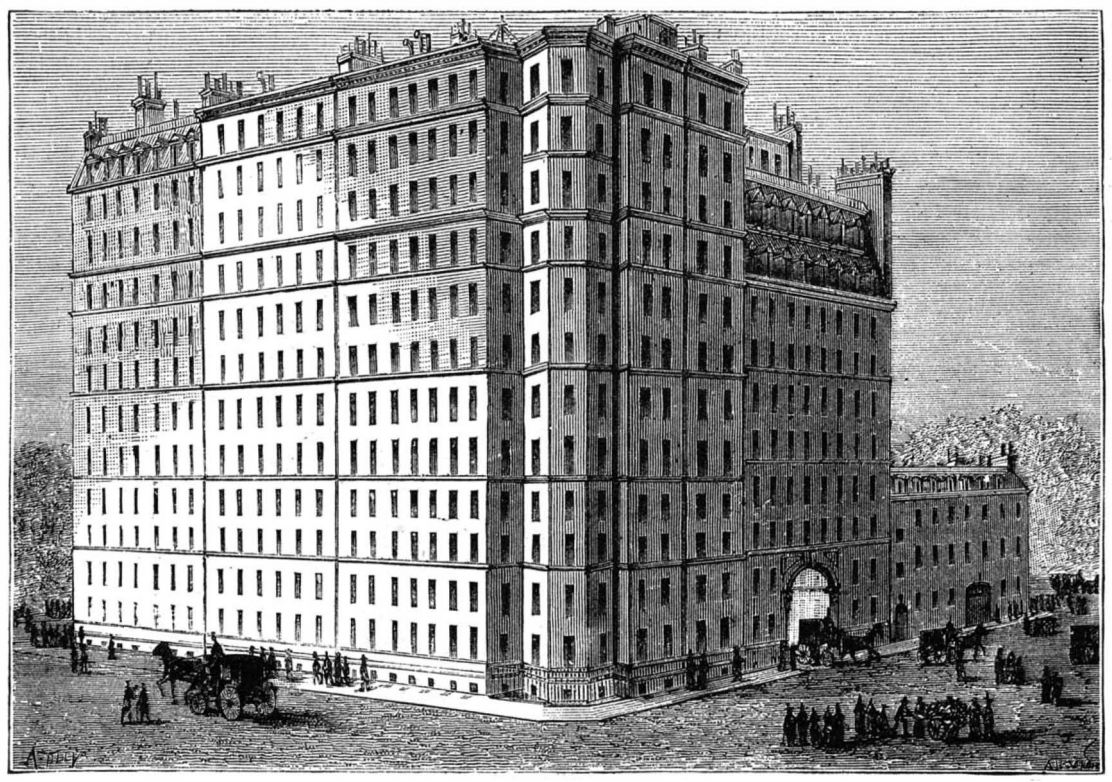
THE promising discoveries of coal in Iowa have been followed by not less promising discoveries of iron ore.

AN ENGLISH FOURTEEN-STORY HOUSE.

During a recent stay in London, says the editor of *La Nature*, we had an opportunity of observing the curious structure shown in the accompanying cut. The building is an apartment house, which, counting the floors beneath the level of the street, and the attics, numbers fourteen stories. Besides these, there are two subcellars. This house is located in a new quarter near the Westminster Abbey. On approaching it, the beholder is filled with astonishment at the aspect of a so truly monumental mass, whose total height is about one hundred and thirty feet. The number of windows in the structure, inclusive of those looking out upon the vast courts within, exceeds five hundred. The tenants of the house and their visitors reach its different stories by means of a hydraulic elevator, which takes about two minutes to reach the thirteenth story. After reaching the latter a marvelous panorama may be observed if the weather is clear. But, as well known, fogs are frequent in London, and it often happens that the tenants of the upper floors are immersed in clouds, after the manner of aeronauts.

There is at Genoa an eleven-story house, and there have been in former times some constructed at Paris of seven and nine stories; and, in the United States, numerous experiments have been made with similar structures, these becoming practicable with the use of elevators.

The City of London has long had the reputation of having houses only of from two to three stories; but the example here brought to notice shows what can be done by English architects, who, it appears, are not restrained, as they would be at Paris, by administrative regulations.



AN ENGLISH FOURTEEN-STORY HOUSE.

Natural Gas for Pittsburg, Pa.

The Philadelphia *Press* reports that a corporation has leased a large gas well at Murrysville, eighteen miles from Pittsburg, with the intention of piping the natural gas to that city for industrial and illuminating purposes. The projectors profess to be confident that they will be able to supply gas enough to Pittsburg to meet all requirements for heating and lighting.

AT a meeting of the New York Microscopical Society, Oct. 10, Dr. William B. Carpenter, of London, summarized his investigations of the structure of Eozoon Canadense, and exhibited many specimens under the microscope. Dr. Carpenter holds to the theory of the organic origin of this much disputed fossil.

New Method of Printing Photographs in Colors.

The Hoeschotype is the invention of Herr F. C. Hoesch, of Nuremberg, who has spent the last three years in bringing his process to perfection. The method by which Herr Hoesch works is at once simple and rapid. A photograph is first taken of the picture. From the negative six gelatine prints on glass are made, and a color plan having been made on one, on each of the other five a separate color scheme is worked out corresponding to the particular tint desired, all the portions not required being painted out. The colors used are the three primaries, a neutral gray, and a brown, and with these five tints any combination can be produced. The gelatine is made insoluble with bichromate of potash, and thus can be printed from in an ordinary lithographic press. The advantage which Herr Hoesch claims is that where a chromo lithograph of an extended scale of tints may require from a dozen to twenty printings, the Hoeschotype may be produced in five printings. The various stages of the color printing by which the finished print is built up are exceedingly interesting. The print we examined was the portrait of a girl. Plate No. 1 showed only the yellow tint graduating from the deep points of color in the hat to the light tints in the hair. The outline of the features was only just discernible, while the cheeks were left white. In the next printing the color was red. Here, where necessary, the red mingled with the yellow, producing orange. No. 3 was blue, and the greens and purples made their appearance in their proper places. No. 4 was a neutral tint of gray, which toned down the crudeness of the three primaries. Finally came the brown, which gave a mellowness and warmth to the shadows, and completed the picture. For the result we have nothing but praise; and if examples like the ones we saw at Messrs. Gladwell's can be produced rapidly and at a small cost, chromo-lithography will be almost superseded. It is evident that some artistic skill in manipulating the gelatine plate is absolutely necessary, for herein lies the power of being able to produce graduated tints at one working; but whether the gelatine is worked upon before or after being bichromatized we are unable to say. So far as the artistic element is concerned, we understand that Herr Hoesch is certain that any South Kensington student of average skill could, with three months' practice, acquire proficiency. If this be so, there is no insuperable difficulty for the artist. We believe that no attempt has been made in connection with enlargements of portraits from life, but we saw several Hoeschotypes of vases from the objects themselves, which left nothing to be desired. Of course it is not necessary to use five tints in every case, and in the reproductions of the vases three only were employed. To insure absolute accuracy in the matching of tints, the inventor has prepared a scale in which every combination of the five colors in certain proportions is shown. Herr Hoesch divides his five colors into fifths, and having thus twenty-five portions to ring the changes upon, he gets 1,600 tints, each of which has a number attached to it which shows on reference to a table that it is composed of so many fifths of one color, and so many fifths of another, as the case may be. The equality of the prints may therefore be depended upon. So far as we could see from the results shown by Messrs. Gladwell, there is hope that the Hoeschotype may take its place before long as one of the recognized art processes of the day.—*Photo. News.*

Gunpowder Engine.

A powder engine has been patented in Germany by Herr Beck. In it a piston is forced to and fro in a horizontal cylinder by small quantities of powder ignited on either side alternately. Powder pans are provided on the bottom within, on which, at the proper moment, powder falls through passages from two holders which rest on distribution slides. The igniting of the powder is effected by means of a spirit or gas flame from the cylinder cover, drawn in through an oblique aperture by the suction force of the piston. The access is regulated by slides. The gases of explosion are expelled through holes furnished with slides, on return of the piston. The heavy residues are pushed by the piston into bags, which are emptied at intervals. It is claimed for the new motor that, with small occupied space, it is very effective and easily set at work. The consumption of powder is comparatively small, and the engine regulates itself. The danger is represented as slight.

ST. LOUIS is to be supplied with water gas for fuel purposes. The laying of pipes is progressing rapidly.

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Correspondence.

The Largest Leather Belt.

To the Editor of the Scientific American:

In your journal of August 19 last, you refer to a leather belt 48 inches wide, which you assume is the largest belt made; this is not so, as we manufactured last year a belt 75 inches wide and 156½ feet long. The belt is now at work transmitting *six hundred* indicated horse power, and gives every satisfaction.

SAMPSON & Co.

Manchester, England.

[It is proper to say that in our paragraph above referred to, the Jewell belt, 48 inches, was mentioned as being probably the largest ever made from a single width of hide. The 75-inch belt of Messrs. Sampson was supplied to the order of the Société Anonyme de Loth (Woolen Mills), near Brussels, a double belt, 75 inches wide and 153½ feet long, to transmit 650 horse power indicated. It is made on their patent system, without cross joints. The power is obtained from a Corliss engine, 800 horse power. From the flywheel, which is 28 feet diameter by 6 feet 9 inches wide, the force is transmitted direct to the weaving shed, which contains 1,000 looms, and spinning mill adjoining. The belt runs perfectly straight, and gives entire satisfaction. The mills are the largest of the kind in Belgium, giving employment to over 3,000 workpeople.]

Ants on the Wing.

To the Editor of the Scientific American:

Owing to the important additions which have recently been made to our knowledge of the habits and ways of ants, the subject has become one of general interest. The following notes may be worth recording:

On the 8th of October, Burlington Bay, in Lake Champlain, was visited by an immense horde of flying ants. The scene of their arrival, or of their *shipwreck*, to speak more properly, was the sandy beach which stretches a mile or more from Rock Point to Burlington city. Along this line the sands were teeming with formic life. It is likely that in an attempt to cross the lake they were caught up by the wind, which was blowing from the south, and thus driven ashore. Many, doubtless, were blown into the water and took passage on the waves, which they seemed to survive, although with some difficulty. Every wave tossed up several individuals, who, half drowned, struggled slowly from the wet sand to the drier driftwood above, and began observations on their surroundings. A large stump, embedded in the sand and stretching its prongs several feet into the air, was covered to nearly half an inch in depth with these swarthy voyagers. This mass of life exhibited restless activity, individuals crowding past their fellows, trampling their neighbors under foot, or pushing them down from their lookout. Those who fell seemed to suffer no inconvenience, but, using their wings in the descent, caught on a convenient place below and began to climb up again.

The activity of these little creatures is worthy of notice. The bee, in the course of her honey-gathering pursuits, frequently comes to rest, but in the case of this ant motion seems to be natural. It moves about continuously, frequently changing its direction, but rarely stopping. This was partly due to their inability to fly. Indeed, their flying apparatus was in many cases sadly out of order, some having lost both pair of wings and others being only partially provided.

For several days these unfortunate ants wandered about the sands of the shore, collecting on the driftwood, or huddling in hollow places to avoid the wind. Some advanced inland, as if for the purpose of exploring the country, in which they were strangers. The number of these small animals could not readily be estimated, but must have been of great size. It was a noticeable fact that the males were greatly in excess of the other sex.

The sexes of ants are not always distinguished with ease. The males, however, may be identified by the number of joints in the antennæ, which is thirteen, and by the wings, which they are supposed to retain throughout life. The females, on the other hand, have twelve-jointed antennæ, an ovipositor or sting, and wings which they lose shortly after maturity. The neuters are noticed to want the last two mentioned characteristics of the female.

It is a well known fact that the male and female ants leave the nest when fully grown, and take to flight. After this the males die, and the females, rendered helpless by the loss of their wings, are cared for by the neuters, who seek a suitable place for a nest, and assume the domestic duties and the care of the offspring. If the appearance of this horde of ants had been earlier, it might thus be accounted for.

F. H. HERRICK.

Rock Point, Burlington, Vt., Oct. 13, 1882.

How the Telephone Business is Growing.

An illustration of the rapid growth of the telephone business generally is found in the increase which has taken place in Lowell, Mass. In the fall of 1877 the exchange was started with sixty subscribers. October 1, 1880, it had 600 subscribers, and at the present time, says the *Boston Globe*, there are about 900 subscribers connected with the exchange, showing an increase of 150 subscribers a year. The company is now putting in about twenty new instruments a month in Lowell alone, and the ratio of increase to the population is about the same throughout the territory covered by the consolidated exchanges. Lowell has one telephone to every sixty-two of its population, a very large proportion. In Portland, Me., there are 700 telephones, and the ratio is one to every fifty of population, the largest ratio in the world in any city of the same size. Considering, however, that there are in Lowell 20,000 mill-operatives, the large number of telephones in use in that city is even more remarkable. One would naturally suppose that the increased use of the telephone, particularly for long-distance talking, would seriously affect the business of the telegraph companies. Oddly enough, this appears not to have been the case. In Lowell, for instance, to-day the telephone company receives and sends as many messages as the Western Union Telegraph Company, and yet the telegraph Company is doing half as large a business again as it was two years ago. The distance from Lowell to Portland is 115 miles, and, unless the atmospheric influences are exceptionally unfavorable, conversation can be readily carried on between these two points. The consolidated New England companies have a standing order with Washburn & Moen, of Worcester, for 300 miles of wire a month. They also have standing orders for 400 signal bells a month from Post & Co., of Cincinnati, Charles Williams, of Boston, the Western Electric Company, of New York, Gilliland & Co., of Indianapolis, and Davis & Watts, of Baltimore. The insulated copper wire, which is used for inside work, comes from the Ansonia Brass and Copper Company and Eugene Phillips, of Providence.

A novel experiment is now in progress with a view to overcoming the difficulties attendant upon long-distance talking. Between Boston and Worcester a line is being constructed of No. 4 gauge wire, which reduces the telephone distance between the two cities about one-half. This line will cost $10,000, whereas an ordinary line of No. 9 wire would cost only about $4,000. If the experiment is a success, the line will be extended to Springfield, and similar lines will be built from Boston to Portland, Plymouth, N. H., and other distant points, enabling subscribers there to talk with Boston as readily as subscribers in Lowell, Salem, Lawrence, and other neighboring places. The ordinary telephone line, running straight across the country, costs from $100 to $150 per mile. The big wire is now completed between Boston and Hopkinton, a distance of twenty miles. Communication over the line on this twenty-mile stretch is as distinct as in the city.

The number of operators required to answer the calls of subscribers is, in Lowell, fifteen to 900, or one to every sixty. The operators are paid from $18 to $30 a month, according to their ability, experience, and the service required of them. They are mostly ladies, between eighteen and twenty-four years of age. The superintendents of exchanges receive salaries varying from $50 to $100 a month. These are the average salaries paid for the work throughout the country.

The Employment of Tobacco.

It is probable that no physiologist would contend that tobacco in any form is essential to the well-being of the body. Thousands of healthy men and the vast majority of women never touch it; yet it is certain that its use is becoming daily more frequent, and that when once introduced into a country it is almost hopeless to eradicate the taste for it. It is clearly not necessary for the exercise of the highest intellectual powers. Dante and Chaucer, Michael Angelo and Raphael achieved their triumphs without its aid; and no encomium of its virtues will be found in the wise sayings of Sancho Panza or in the pages of Shakespeare; nor have we any record that Milton composed under its influence, unless, indeed, a habit of smoking in bed led to his not very clearly explained connubial disturbances, and to his tart treatise on divorce. Be this as it may, the eagerness with which it is sought after by its devotees, who allow neither manners, nor the presence of ladies, nor the comfort of others to interfere with their enjoyment, the distress that is occasioned by a temporary failure of the pernicious weed; the difficulty with which the habit of smoking once acquired is broken—indicate clearly enough that it supplies some want in the economy or exercises some influence on the system which cannot be replaced by other means. To many men a poison, to others tobacco is the very staff of life, and to be without it is the extremity of misery. Enforced abstinence from it is to many a convict the severest part of his sentence, and the cunning and deception, as well as bribery, employed to effect its introduction into prisons are well known. An amusing address has lately been delivered by M. Bouley to the Societe contre l'Abus de Tabac, on the economical and hygienic aspects of the use of this narcotic. The total value of the tobacco smoked in France amounts, he tells us, to no less than 352,538,000 francs, nearly eighteen millions sterling, which immense sum represents the increase in the taste for tobacco since the year 1830, when this singular habit took its origin from the leisure of the Corps de Garde after the restoration of the National Guard suppressed by Charles X., M. Bouley points out how smoking has effected an intellectual separation between men and women, conversation being no longer maintained after dinner as in his earlier years. The men are anxious to smoke, and the ladies retire early, to the great detriment, in his opinion, of the mental faculties of both sexes. He is reminded by the present condition of things of Voltaire, who, when condoled with by Piron on the ill-success of one of his comedies, ventured to say, "Well, at any rate, they didn't hiss it." "No," replied Piron, "how could they, when they were yawning all the time?" In France the state promotes smoking, since each soldier receives, every ten days, 100 grammes of tabac de cantine, on payment of the extremely moderate sum of fifteen centimes. It is given in the belief that it constitutes to some extent a substitute for food, and affords relief to, or at least prevents grumbling at the monotonous character of the diet. As long ago as 1854, Marshal St. Arnaud, when at Varna, wrote to the Intendant of the War Department: "Have you sent tobacco for the troops? It is very important, for tobacco is undoubtedly the best means we possess to prevent attacks of nostalgia and to alleviate the miseries of the bivouac." General Brac, again, in his "Traite des avant Postes," strongly insists that a taste for smoking should be cultivated in the light cavalry, on the ground that it keeps him awake, employs spare moments that would otherwise be employed in thinking, and keeps him near his horse, which he sees has its forage and is not abused. "How comforting it is!" he adds; "in the early morning; it drives away sleep, and renders the rain less cold, thirst less severe." The pipe, again, demands a steel and some tinder, and the implements for the production of the bivouac fire are therefore always at hand. But there is another side to all this. Dr. Blanchet, an army surgeon, writes that "constant association with the soldier, and inquiring into the effects of smoking, have taught him that the illness of many men is to be traced to the abuse of tobacco alone. Ulcers on the lips, in the mouth, on the tongue, in the nose, necrosis of the maxillary bones, are not uncommon results of its use. Others suffer frightfully from gastralgia, gastritis, and enteritis; others from vertigo, mental debility, and even transient attacks of mania." Who is in error here, the general or the surgeon? What have our English surgeons to say to it? In moderation, as Sir B. Brodie said long ago, it probably acts as a calmative to the nervous system, especially when in a condition of excitement and worry, and its abuse only should be deprecated.—*Lancet.*

Tar Roofs.

The London *Builder* says that the German Government has on several occasions pointed out to farmers and others interested in agriculture that too great an expenditure of capital on buildings is a mistake. With a view of illustrating the application of this principle of economy to roofing, the *Cologne Gazette* points out that the system of using tar for roofing purposes is at the same time economical and suitable for agricultural buildings, and what is said may serve as an answer to a recent inquiry in our own pages. The framework of the roof can be of relatively slight construction on account of the nature of the covering it is intended to support, and the perpendicular height of the roof can be one-eighth to one-tenth of the entire depth of the building. The distance of the rafters is arranged according to the width of the covering material, the scale being that from the middle of one rafter to the middle of another. The distance should be 2⅜ in. less than the width of tar roofing sheets.

Immediately upon the rafters come boards, and upon these (exactly in the center of the separate rafters) are placed strong laths, about 2 in. wide and 1⅝ in. thick, the upper edges being taken off. The roofing sheets are now placed so as to cover the spaces between the laths, and are nailed. Over the laths are placed strips of paper, 5 in. to 6 in. wide, fastened with nails at intervals of 2⅜ in.

In order to make the sheets lie smoothly upon the boarding, it is suggested, in case they are too dry, to soften them by immersion in water. It is recommended that the workmen should not wear heavy-nailed boots, and also, that if the rain comes on, the roof should not be walked upon immediately after. When the entire surface of the roof is covered with sheets, the strips of paper (or caps) already named, as well as the joints, are painted over with a hot mixture of coal tar and pulverized lime. Pure dry sand is at once sprinkled over this coating, and particular care must be taken that all the nail-heads are well covered. When the paint is dry the whole surface of the roof is once more coated with the same mixture, and is sanded.

The object of this careful method of overlaying the roof with several coatings of specially prepared solutions is to preserve in the tar those oleaginous and fatty properties which it soon loses if exposed to the air, and the retention of which is an indispensable condition of its resistance to water. Clay and sand do not afford sufficient protection, and they are removed by violent winds.

Reference is made to various systems of coating the tar roof with protective substances, for the purpose indicated. One of the most successful methods consists of a mixture of cow dung and thin white lime, which is spread over the entire surface of the roof. If such a coating is not applied the tar paint must, during the first four years, be annually renewed, which enhances the cost of the roof. If the last-named protective composition is used, and renewed every two years, the coating of tar and lime can be dispensed with. Particular mention is, however, made of a coating of tar mixed with Portland cement, the tar being well heated and used in the proportion of 111 pounds to 200 pounds of cement. The mixture should be kept well stirred during the preparation, and should be applied as soon as made. This particular method has been tried in many cases in Germany, and, according to the journal quoted from, its satisfactory results have caused its adoption upon a scale of progressive importance.

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ASPECTS OF THE PLANETS FOR NOVEMBER.

VENUS

is evening star, and leads off in the programme by initiating the most brilliant event of the month at its commencement. On the 1st day of November she reaches her period of greatest brilliancy as evening star, as every one who looks upward to the heavens will gladly acknowledge. She is also a beautiful object in the telescope, especially when observed in the daytime, for her light, unpleasantly dazzling on a dark sky, is then subdued to a soft, pearly luster. In the present part of her course she takes on the phase of a waning crescent, becoming larger, sharper, and thinner as the month advances, and she comes really nearer the earth, and apparently nearer the sun.

No one who has closely studied this charming planet need be told that the variations in her appearance are very great. When at superior conjunction, and on the opposite side of the sun, she is one hundred and sixty million miles distant, and presents the aspect of a small round disk, 10″ in diameter. When at inferior conjunction, where she will be on the 6th of December, she is directly between the earth and the sun, is only twenty-five million miles distant, and, if her whole face were visible, she would be 64″ in diameter. But her dark side is then turned toward us and she is invisible. Between these positions she takes on all the phases that the moon takes on from full to new. The law of her movement is that the nearer she comes to the earth the smaller is the portion of her illumined disk; but the larger would her disk appear if the whole of it were visible. Her greatest brilliancy occurs thirty six days before her inferior conjunction. After that period her illumined crescent diminishes so rapidly that the increasing nearness to the earth is insufficient to make up for her lessening light and her glory visibly wanes. This month is, therefore, the time to enjoy the lovely evening star, which, at its close, will be nearly eclipsed in the sun's rays, and will for many months cease to shine in our evening sky.

The right ascension of Venus is now 17h. 52m.; her declination is 28° south, and her diameter is 42″. Her place is in the constellation Sagittarius.

Venus sets about half-past six o'clock in the evening; at the end of the month she sets a few minutes before five o'clock.

SATURN

is morning star until the 14th, and evening star for the rest of the month. On the 14th, at 10 o'clock in the evening, he reaches the most interesting point in his course, as far as terrestrial observation is concerned. He is then in opposition with the sun, apparently farthest from the sun, and really nearest to the earth. The sun, the earth, and Saturn are in a straight line, with the earth in the center, and the planet is one hundred and eighty million miles nearer to us than when in conjunction. He is literally opposite the sun, for he rises when the sun sets, and sets when the sun rises.

The present opposition of Saturn is one of remarkable brilliance, combining three favorable conditions, all tending to increase the interest of his appearance as he comes glowing with soft light above the eastern horizon in the early evening. He is in high northern declination, and the law is, the farther north the planet the better is the position for observation. His rings are opening to their widest extent, thus largely increasing his size and brilliancy. He is approaching perihelion, the happy combination of events all lending an *éclat* to the Saturnian opposition of 1882. The wonderful planet deserves the closest study, and no one who has access to a telescope should fail to improve the opportunity for a view of this magnificent member of the system, with his rings, belts, and moons.

It seems anomalous to call Saturn a morning star when he rises before six o'clock in the evening. But astronomy has inexorable laws, and one of these laws is that the outer planets, including Mars, Jupiter, Saturn, Uranus, and Neptune, are morning stars from conjunction to opposition, and evening stars from opposition to conjunction. Therefore Saturn is classed as morning star until the 14th.

His right ascension is 3h. 28m.; his declination is 16° 22′ north, and his diameter is 19″. His place is in the constellation Taurus, differing little from that of last month.

Saturn rises on the 1st a quarter before six o'clock in the evening; at the end of the month he sets about a quarter before six o'clock in the morning.

JUPITER

is morning star during the month, and the brightest star in the heavens while he is above the horizon. For before he reveals his regal presence the short-lived glory of Venus has passed away, the peerless planet being hidden below the horizon.

The right ascension of Jupiter is 6h. 5m.; his declination is 23° north; and his diameter is 42·6″. His place is in the constellation Gemini.

Jupiter rises on the 1st a few minutes before eight o'clock in the evening; on the 30th he rises a few minutes before six o'clock.

NEPTUNE

is morning star until the 9th, and evening star the rest of the month. On the 9th, at four o'clock in the afternoon, he is in opposition with the sun; as he is then at his nearest point to the earth, he may be easily seen in a good telescope. He is the first of the four giant planets to reach opposition, preceding Saturn five days. The same laws govern his movements at opposition as those that have been described in the case of Saturn, but owing to the immense distance of this wanderer on the system's verge he is never visible to the naked eye.

Neptune's right ascension is 3h. 3m.; his declination is 15° 20′ north; and his diameter is 2·6″. His place is in the constellation Taurus, near that of Saturn. There is only twenty-one minutes' difference in the time of transit of the two planets.

Neptune rises on the 1st about half-past five o'clock in the evening; on the 30th he sets about a quarter after five o'clock in the morning.

URANUS

is morning star during the month, but possesses little interest for the student.

His right ascension is 11h. 31m., and his declination is 3° 54′ north. He has entered the constellation Virgo, where he will remain for the next seven years.

Uranus rises about half-past two o'clock in the morning; at the end of the month he rises thirty-nine minutes after twelve o'clock.

MERCURY

is morning star throughout the month. On the 7th he reaches his greatest western elongation, and is then 19° 3′ west of the sun. For a week before and after that time he may be picked up as a beautiful morning star by bright-eyed observers. It will be the only opportunity for a glimpse of his face during the rest of the year. He rises on the 7th a few minutes after five o'clock, an hour and a half before the the sun, and must be looked for 8° north of the sunrise point. The bright star in his vicinity is Spica. It will be of no use to look for him unless the sky be exceptionally clear.

The right ascension of Mercury is 13h. 28m.; his declination is 7° 11′ south; and his diameter is 7·8″. His place is in the constellation Virgo.

Mercury rises on the 1st about five o'clock in the morning; on the 30th he rises about half-past six o'clock.

MARS

is evening star, and approaches conjunction. His right ascension is 15h. 14m., and his declination is 18° south. His place is in the constellation Libra.

Mars sets about half-past five o'clock in the evening; at the end of the month he sets about half-past four o'clock.

THE MOON.

The November moon fulls on the 24th at eighteen minutes past nine o'clock in the evening. The waning moon passes about 3° north of Mercury on the morning of the 9th, and will thus be a help in discovering the sky planet. The new moon of the 10th passes 56′ north of Mars on the 11th, and the three days' old crescent makes a lovely celestial picture, in conjunction with Venus, on the 13th. The moon pays her respects to Neptune on the 23d, to Saturn on the 24th, and to Jupiter on the 26th.

Railway Progress in Mexico.

The twenty-fifth anniversary of the opening of the first Mexican railway was celebrated July 24. The only railroad existing in 1857 was between four and five miles long. About 300 miles were added during the next fifteen years. In 1877 a new period of railway activity was begun, and since then nearly 2,000 kilometers—about 1,200 miles—have been put in operation. Before 1877 the only roads built were from Mexico to Vera Cruz, 471 kilometers; Vera Cruz to Jalapa and Coatepec, 144 kilometers; and various tramways aggregating 140 kilometers.

The roads now in operation or in process of construction are given officially as follows·

	Kilometers.
Vera Cruz to Mexico City, and branch to Puebla	371
Vera Cruz to Jalapa and Coatepec	144
Vera Cruz to Medellin	22
Esperanza to Tehuacan	50
Merida to Progreso	36
Mexico City to Leon (Mexican Central)	409
Mexico City to Toluca (Mexican National)	73
Mexico City to Cuantla Morelos	138
Paso del Norte to Chihuahua (Mexican Central)	360
Puebla to San Martin	38
Puebla to San Marcos	34
Vera Cruz to Anton Lizardo and Alvarado	25
Vera Cruz to Jalapa and Chalchicomula	19
Pachuca to Irolo and Teoloyucan	45
Altata to Culiacan	30
Meridan to Peto	26
San Luis Potosi to La Soledad (Mexican National)	6
Tampico to San Luis Potosi (Mexican Central)	38
Mexico City to El Salto (Mexican National)	83
Matamoras to Monterey (Mexican National)	7
Zacatecas to San Luis Potosi (Mexican National)	23
Mexico City to Toxoco	28
Nuevo Laredo to Monterey (Mexican National)	170
Guaymas to Magdalena	200
Puebla to Matamoras Izucar	23
Chalco to Tlalmanalco	15
Tramways in federal districts, city of Puebla, and city of Guadalajara	130
Total	2,626

This is equal to 1,632 English miles.

The Mexican National Railway from Corpus Christi, Texas, reached Monterey, a distance of 333 miles, Aug. 31.

Zinc in Boilers.

Since 1875 experiments have been carried on in the French marine, particularly with boilers having surface condensers, to test the efficacy of zinc leaves in neutralizing the effect of fatty acids in the boiler and giving rise to inoffensive products. Commandant Frené has recently given an account of the results obtained on board the Desaix to the French Academy of Sciences, of which *Engineering* gives the following summary:

The zinc inside and the iron of the boiler constitute a voltaic element which decomposes the water and liberates oxygen and hydrogen. The oxygen forms oxide of zinc, which combines with the fatty acids mingled with the feed water, thus forming "soaps" of zinc, which, coating the tubes of the boilers, prevent the adhesion of the salts left by evaporation. It is easy then to brush away the fixed matter on the tubes which is in a mealy state. As to the hydrogen, it behaves as MM. Gernez and Donny have described in the *Annales de Chimie et de Physique* for 1875. Ebullition takes place by evaporation at the surface of a gas whether dissolved in the liquid or clinging to the solid envelope of the containing vessel. If the gas is expelled from boiling water the latter can be superheated to 30° or 40° Cent. above the normal boiling point, and in such a case evaporation only takes place at the surface. When the temperature of the vapor emitted corresponds to the tension which equilibrates the pressure exercised at the surface of the liquid, the ebullition can be started at will by introducing a gas bubble into the liquid. Solid bodies operate in the same way by reason of the film of gas adhering to them. When by long boiling all the gas is expelled, the water becomes superheated, and thus an element of danger is introduced. But by the employment of zinc in the boiler a constant supply of gas is maintained, and all danger of superheating is avoided. The hydrogen not only starts the boiling, but keeps it up. It is, however, necessary from time to time to take out the zinc plates from the boiler and clean from them the salts adhering to them, else the galvanic action will dwindle and perhaps stop altogether. M. Frené is of opinion that the action of the zinc is, however, not so regular as theory might expect, and advocates the substitution of a sure and constant mechanical action under the form of a moderate but continuous injection of warm air by the lower part of the boiler, or, better still, a non-oxidizing gas, such as carbonic acid. This plan, he thinks, would produce a perfectly regular ebullition, a rapid evaporation, a saving of fuel, and freedom from risk. Superheating, which he figuratively calls a sleep of the liquid, would be no longer possible. The carbonic acid could be developed by the combination of carbonate of lime and hydrochloric acid.

New Green Pigment.

Chromium is always determined either as green oxide or as lead or barium chromate. It may also be exactly determined as phosphate, and this method is often convenient. A. Carnot says, in *Comptes Rendus* of May 8, that in boiling a solution of a salt of chromium slightly acidified, to which has been added an alkaline phosphate and sodium acetate, the whole of the chromium is precipitated as phosphate. This method succeeds both with the green and the violet salts, chlorides, and sulphates, and with the acetates, but not with the oxalates. It is also suitable for alkaline chromates, but in this case the action of the phosphoric acid must be combined with that of sodium thiosulphate (hyposulphite), which acts as a reducing agent. The solution of chromate, to which is added a sufficient quantity of phosphoric acid or of a phosphate, then of acetate, and lastly of hypophosphite, and which has been slightly acidified, is boiled for about an hour; it deposits all the chromium as phosphate, with a little sulphur derived from the hyposulphite. The phosphate precipitated is a green hydrate. It may be washed with boiling water, or, preferably, with hot solutions first of ammonium acetate followed by ammonium nitrate. On calcination it turns gray, and contains chromic oxide in the proportion of 51·86 per cent. In former researches on the determination of aluminum (*Comptes Rendus*, July 18, 1881), Carnot showed that alumina can be readily separated from chromium by converting the latter into an alkaline chromate, acidifying the solution slightly with acetic acid, and adding an excess of sodium phosphate. The mixture is boiled and filtered to separate the aluminum phosphate. When this is done it is easy to determine the chromium by pouring into the liquid hyposulphite, and, if needful, a further quantity of alkaline phosphate, and boiling. The precipitate of chromium phosphate is then washed, ignited, and weighed. The same reaction is capable of industrial application. It yields an insoluble green coloring matter, which retains, when dry, a very fine shade, and may be used in painting in place of the dangerous compounds of arsenic and copper. This color, which is perfectly inoffensive, may also be used in dyeing, as the insoluble green phosphate may be produced in the fiber.

A Growing Youth.

Jean Condoist has been brought to Paris as a medical curiosity from the Haute Caône. According to a medical contributor to a Parisian contemporary, this youth, aged 19, took a start on the 17th of May, 1881, being then six feet three inches high, and found one morning that he had grown an inch. Every week since then has he registered himself, and on the 14th of September this human beanstalk had gained nearly five inches; he grew five inches more before the 20th of January, 1882, and seven more before March 15, and he now stands 7 feet 10 inches. All this has been accompanied by great pains in the back, and he stoops considerably; but since last June, it is his legs only that have grown, and his feet are already twenty-four inches long.—*London Pall Mall Gazette.*

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JACQUET'S WATER METER.

The Jacquet water-meter, shown in the accompanying engravings, consists of three very distinct parts:

1. A cylinder, whose capacity and number of piston strokes determine the volume of the liquid that has traversed the apparatus.

2. A system of valves that changes at each extremity of the piston stroke the direction of the distribution of water.

3. An ordinary dial-train, which, actuated by the endless screw of the arbor of a ratchet-wheel, registers the quantity of water measured by the meter.

Fig. 1 is a perspective view of the apparatus. Fig. 2 is a vertical section. Fig. 3 is a horizontal section of the distributing box, and Fig. 4 is a transverse section of this same box.

The cylinder consists of a cast iron box, having inside of it a thin brass cylinder in which moves vertically a piston formed of two pieces of leather held back to back by two disks of copper and galvanized sheet iron.

The distributing box, which is also of cast iron, is bolted on to the cylinder. It is divided by vertical partitions into four chambers—one communicating with the bottom of the piston, a second with the top, the third with the inlet, and the fourth with the outlet.

These compartments communicate with each other through four transverse orifices, traversed two by two by iron axles, each carrying two circular valves. These axles are connected by means of a crosspiece containing a rectangular aperture in its center. The axles, crosspieces, and valves form together a rigid whole, capable of being moved in a longitudinal direction, so that if two of the valves are closed, the two others are of necessity open, and reciprocally; or, in other words, if the inlet and the top of the piston are in communication, the bottom of the piston necessarily communicates with the outlet, and *vice versa*. In the center of the distributing box there is fixed a bracket of hard bronze, which holds in a lower groove a knife whose back serves as a bearing point for a stirrup-shaped spring. The center of rotation of this spring, which consists of six strips of Prince's metal, is in the vertical axis of the knife. Owing to such an arrangement, the knife, rolling at one side in the bracket, and at the other on the spring, is always pushed to the right or left without ever resting in the median position, which is one of unstable equilibrium. The knife, which likewise is constructed of hard bronze, carries two arms at right angles, one of which engages in the aperture in the crosspiece, and the other in a groove that the piston rod carries. The apparatus works as follows:

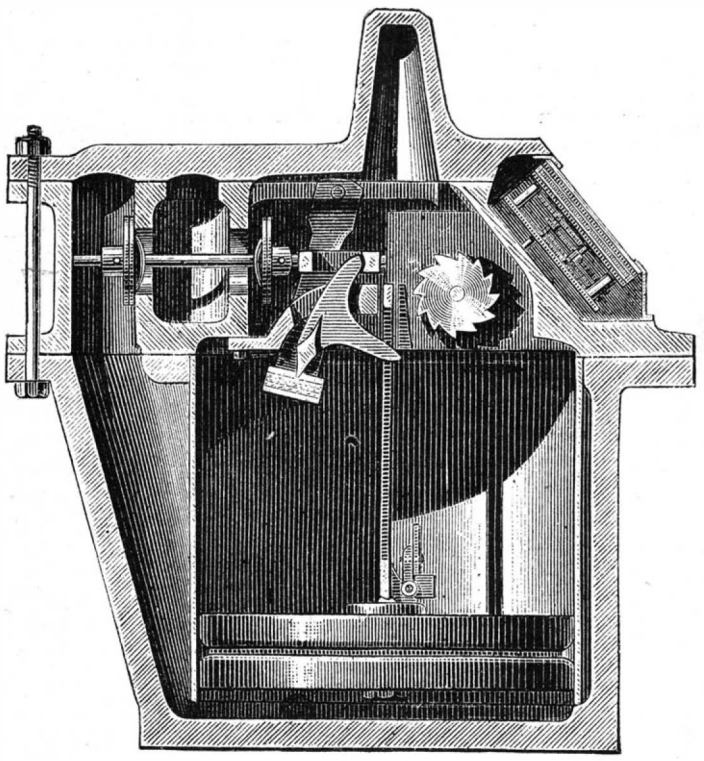

Fig. 2.—VERTICAL SECTION OF JACQUET'S WATER METER.

In the initial position, the valves, S and S′, are closed, and the two others, *s* and *s*′, are open. The inflowing water communicates with the bottom of the piston, while the top is in communication with the outflowing water. The piston rises, and the knife arm engages with the groove in the piston-rod. But, when this latter reaches the limit of its travel, the bottom of the groove rests on the arm, forces the knife to describe a rotary motion, which has the effect of stretching the spring. During this time the other knife-arm slides in the aperture of the crosspiece, and, at the precise moment at which, through its presence there, it is about to change the distribution, the spring, which has gone beyond its maximum point, stretches and suddenly opens the valves, S, while at the same moment the second valves close. As the inlet is then in communication with the bottom of the piston, the latter instantly redescends, driving out through the outlet the water that it has measured during its travel. The motion then takes place in a contrary direction, until the top of the groove in the piston-rod produces, through its action on the knife-arm, an opposite effect, but one that is identical with that just described. Finally, during the ascent of the piston, a pawl carried by the latter causes a cast iron ratchet-wheel to advance by one tooth.

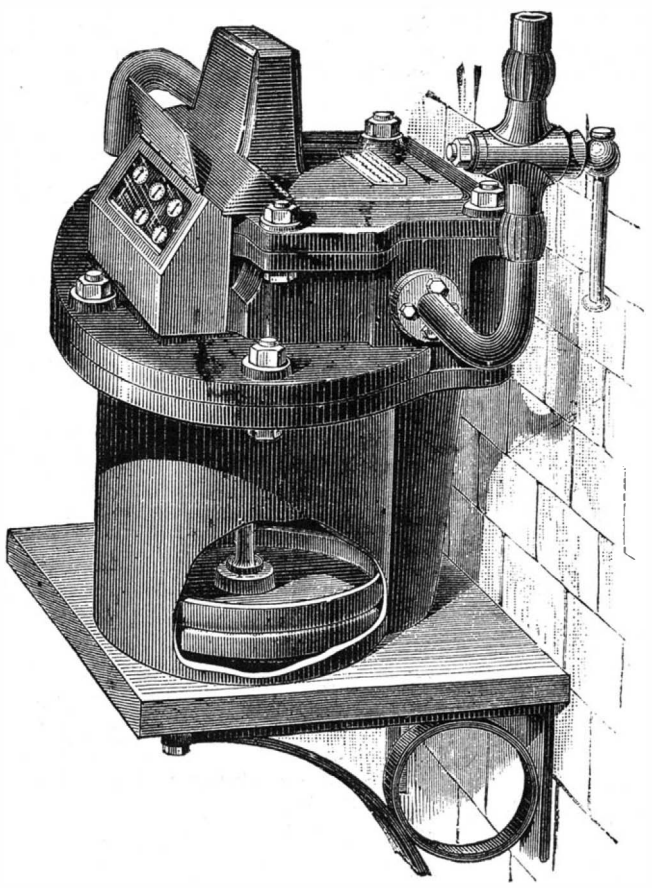

Fig. 1.—JACQUET'S WATER METER.

The arbor of this wheel actuates, through an endless screw, a clockwork movement, which in its turn registers the water that traverses the apparatus in cubic meters, hectoliters, and decaliters.

It is easy to understand that, as the water is measured by the volume of the cylinder, and as the piston makes a tight joint at every pressure, this meter registers with exactness all the water that has passed through it. Moreover, the closing of the valves on their seats being tight, and the change of distribution occurring instantaneously, the apparatus marks and measures with exactness to a minimum discharge of one liter in a hundred minutes. As for the maximum discharge of the meter, the following table, drawn up from experiments, will give sufficient information.

Diameter of the Orifice of the Meter in Millimeters.	Pressure on Entrance in Meters of Water.	Discharge in Litres, per hour.
10	30	2,400
13	30	4,000
15	30	5,400
20	30	8,000
25	30	10,000
30	30	12,000
40	30	24,000
70	30	100,000

As regards the length of time that the Jacquet meter will work well, it must be remarked that provision is made against wear by a sandbox placed at the inlet to the apparatus, and which prevents gravel and other solid bodies from entering the distributing chambers; and, as regards all plastic impurities, such as mud, carbonate of lime, etc., that the water might hold in suspension, no deposit of these is to be feared. The piston, in fact, working vertically, deposits could only occur on the bottom of the cylinder or the top of the piston, without ever being in contact with the parts in friction.

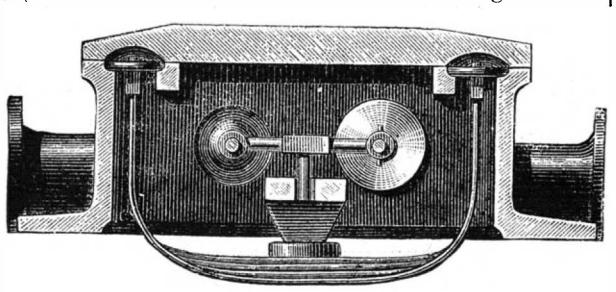

Fig. 4.—TRANSVERSE SECTION.

Finally, the knife, which, with the spring, is the delicate part of the meter, is made of bronze of a hardness equal to that of steel. Moreover, although the great elasticity of the spring might compensate for the wear on these parts, the inventor desired to obtain certain data in regard to this point. So, with a file, he executed the work of time on the knife, and, with thirteen pieces worn away each a half millimeter more than the other, he undertook a series of experiments on meters of 0·02 of a meter orifice. The subjoined table shows the results of these trials under a pressure of water, at the inlet, of 30 meters:

Height of Knife in Millimeters.	Power of Spring in Kilogrammeters.	Discharge in liters per hour.	Observations.
23 (Normal).	4k.(Normal).	8,000	Operation good
22.5	3.7 k.	8,000	"
22	3.6 k.	8,000	"
21.5	2.25k.	8,000	"
21	1.8 k.	8,000	"
20.5	1.4 k.	8.000	"
20	1.2 k.	8,000	"
19.5	0.9 k.	8,000	"
19	0.75k.	8,000	"
18.5	0.65k.	8,000	"
18	0.4 k.	8,000	Expansion less free.
17.5	0.3 k.	8,000	"
17	0.2 k.	8,000	Meter stops; the water does not flow.

These proofs are conclusive, and the more so in that these same experiments, repeated with a pressure of 3 meters of water, led to the same results. In practice, the meter under trial at the City Laboratory has already registered 4,000,000 liters without the least evidence of its giving out, and it is to be presumed that, as regards duration, this apparatus may be classed among the best.—*Revue Industrielle.*

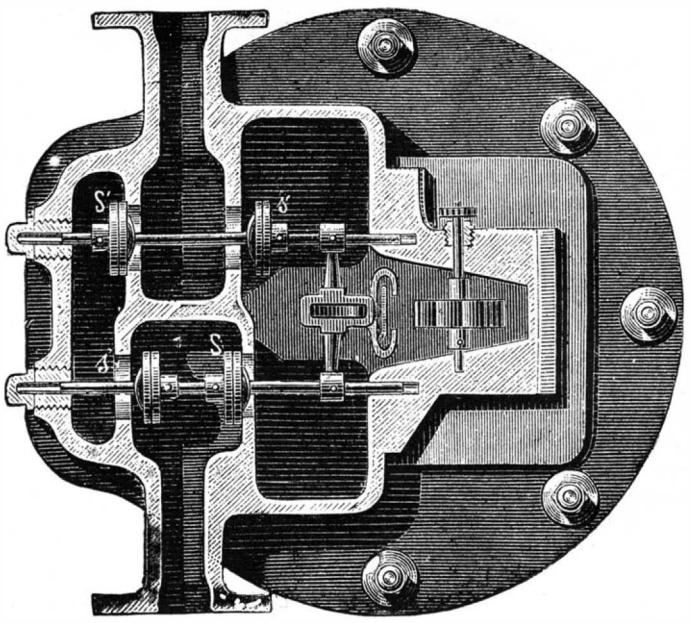

Fig. 3.—HORIZONTAL SECTION.

Explosions without Fire and with Fire.

Two interesting cases of explosion are described by Herr Pfaundler in a recent number of Wiedemann's *Annalen:*

A closed glass tube, two-thirds filled with liquid carbonic acid, was inserted a few centimeters deep in a bath of carbonic acid and ether, brought to a temperature of —100° C., in order to get crystallized carbonic acid. Beautiful crystals were soon formed in the immersed part of the tube, and a layer of the liquid acid remained above. The tube was then raised by its upper part into the air, and in a few minutes it exploded violently. This tube had often before borne a rise of temperature to 31°. The explosion is attributed to thermal expansion of the solid carbonic acid (as a more likely cause than vapor-pressure on glass rendered brittle by a low temperature).

In the second case, a large sheet zinc bell-gasometer, used exclusively for keeping oxygen gas, was concerned. It had stood about six months unused, containing a little of the gas. When the issuing gas was being tested with a glowing match, an explosion occurred, shattering the apparatus. Any entrance of hydrogen or coal gas is out of the question. It is supposed that the water had gradually absorbed acid vapors from the air of the laboratory, and that the zinc had been thus attacked, yielding hydrogen. The zinc was in fact somewhat corroded. It is recommended that the zinc in such cases be coated with a lac.

Pure Hydrochloric Acid.

Giudice prepares the *pure* acid, whether gas or liquid, for experimental purposes, by the action of sulphuric acid on sodium chloride, but adds to the former some oxidizing substance like potassium bichromate or permanganate, or the black oxide of manganese. The gas is passed through mercury, contained in a Liebig's potash bulb, or other suitable apparatus, before it is passed into water or used.

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A FUEL THAT PRODUCES ELECTRICITY.

The object which M. Brard, of La Rochelle, has in view in his researches is to produce an apparatus capable of transforming heat into electricity without having recourse to the complications presented by dynamo-electric machines which have been hitherto inapplicable for domestic illumination. M. Brard wishes to produce a veritable electro-generative stove, furnishing at the same time heat, light, and electricity. After having demonstrated by his experiment that thermo-electric batteries have on one hand only a feeble production, and on the other hand are soon rendered useless under the action of heat, M. Brard thinks he has found, according to the *Electrical Review*, the solution of the difficulty in a thermo-chemical battery, in which the current is produced by chemical action, the combustion of carbon, under the influence of an elevated temperature produced by a special method, by the oxidizing action of nitrate of potash or soda. It forms thus a veritable thermo-chemical battery, analogous to the ordinary batteries, in which the oxidizing of the carbon takes the place of the oxidizing of the zinc, and the nitrate of potash of the oxidizing body. The carbon is, therefore, the negative pole, and the nitrate the positive pole of the element.

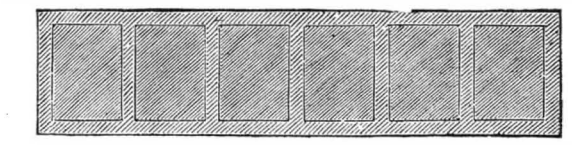
M. Brard alluded, in reference to his labors, to the experiments of Antoine-César Becquerel in 1855, and those more recently made by M Paul Jablochkoff in 1877; he has, however, gone further than his antecedents in this way, for he has presented to the association the principal features of an apparatus actually in construction, and showed some electro-generative slabs which we are about to describe, reserving the description of the complete generator until it has been tried, and until it has undergone certain modifications which the experiments will suggest.

Electro-generative Slab.—The electro-generative slab may be defined as *a piece of prepared carbon, which, when thrown into the fire, produces electricity by its combustion.* The subjoined figures, which represent the exterior view of it, the longitudinal section, and the transverse section, will demonstrate clearly the principle of it.

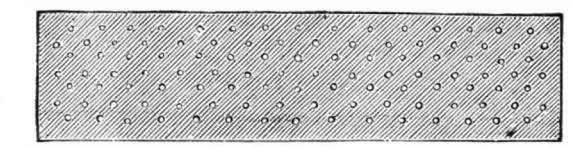
The slab presents the external appearance of a parallelopiped, about 15 centimeters (6 inches) long, 3½ centimeters, (2 1-6 inches) wide, and 25 millimeters (1 inch) thick; the materials which compose it are enveloped in a sheet of asbestos paper, only two thin sheets of brass being exposed to view, which serve as conductors of the current. The interior consists theoretically of a prism of carbon and a prism of nitrate of potash, separated by a plate of asbestos, which plays very nearly the same part as the porous cell in ordinary batteries. In practice the sheet of carbon is formed of about 100 grammes of coal-dust, formed into a paste with molasses or tar. The paste thus obtained is strongly compressed, cold or preferably with heat, in a mould of suitable form, at the bottom of which has been placed previously a sheet of copper, of brass, or any other metal which is a good conductor, cut into several strips, which are found embedded in the agglomeration of the carbon and project from one of its extremities to constitute the negative pole. The mould is disposed in such a manner that the slab is perforated throughout its thickness with numerous holes intended to facilitate combustion and to multiply the points of contact of the carbon with the nitrate, as we shall presently see. It bears besides upon the upper surface rectangular depressions, 15 millimeters deep, divided by transversal partitions more or less numerous, obtained by the moulding. The angles thus formed are intended to prevent the flowing of the melted nitrate into the fire during the working of the apparatus. The whole surface of these compartments is covered by a thin sheet of asbestos paper. The upper part of the brick is formed of a mixture of three parts of ashes and one part of nitrate of soda or potash. The ashes are intended to prevent a too rapid combustion, and to prevent the slab from melting. This mixture is melted and poured upon the brick very hot and in a sirupy state. About 100 grammes per slab are required, equal to about 25 grammes of nitrate and 75 grammes of ashes. A second sheet of copper or brass analogous to the first is embedded in the nitrate before cooling, and forms the second pole of the slab. The whole is enveloped in a sheet of asbestos paper.

It is sufficient to place in a fierce fire the extremity of the slab opposite to the conductors, in order to obtain in a few minutes a continuous current—and a constant one if the slab is homogeneous—during its combustion, lasting an hour and a half to two hours. M. Brard has not yet taken the constants of this new thermo-chemical battery, but in an experiment which we owe to the chemical department of the laboratory of the Lycée of La Rochelle, a single slab was sufficient to actuate an electric bell of the ordinary commercial form. One can, moreover, burn several briquettes at once, and group them in tension or in quantity to increase the effect. Three or four slabs in tension produce the decomposition of water.

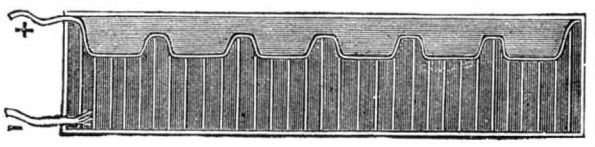
Such are the results at present obtained by M. Brard. Without expressing an opinion as to the future and the results which will be obtained from this apparatus, which is



TOP VIEW.

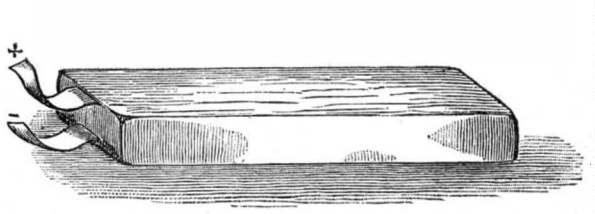


UNDERNEATH VIEW.



LONGITUDINAL SECTION.

TRANSVERSE SECTION.



GENERAL VIEW OF SLAB.

at present confined to the laboratory, we may observe that these researches are very interesting, and that to M. Brard must be ascribed the honor of having been the first to construct a veritable *electro-generative combustible.*

Decline in the Salmon Catch.

The salmon catch this year on the Pacific coast has been the smallest for many years. The canners blame the Chinese, but say nothing of the frightfully wasteful fishing wheels which they themselves have been using of late, destructive devices which unprejudiced observers have predicted would produce the result now complained of by killing all the young fish.

MEETING OF THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AT LA ROCHELLE.

The eleventh meeting of the French Association for the Advancement of Science recently took place at La Rochelle. As usual on such occasions, many interesting excursions were made to localities where historic curiosities abound. We shall not describe all these excursions, but shall speak only of the more interesting of them, and especially of the visit to Esnandes and its mussel crawls.

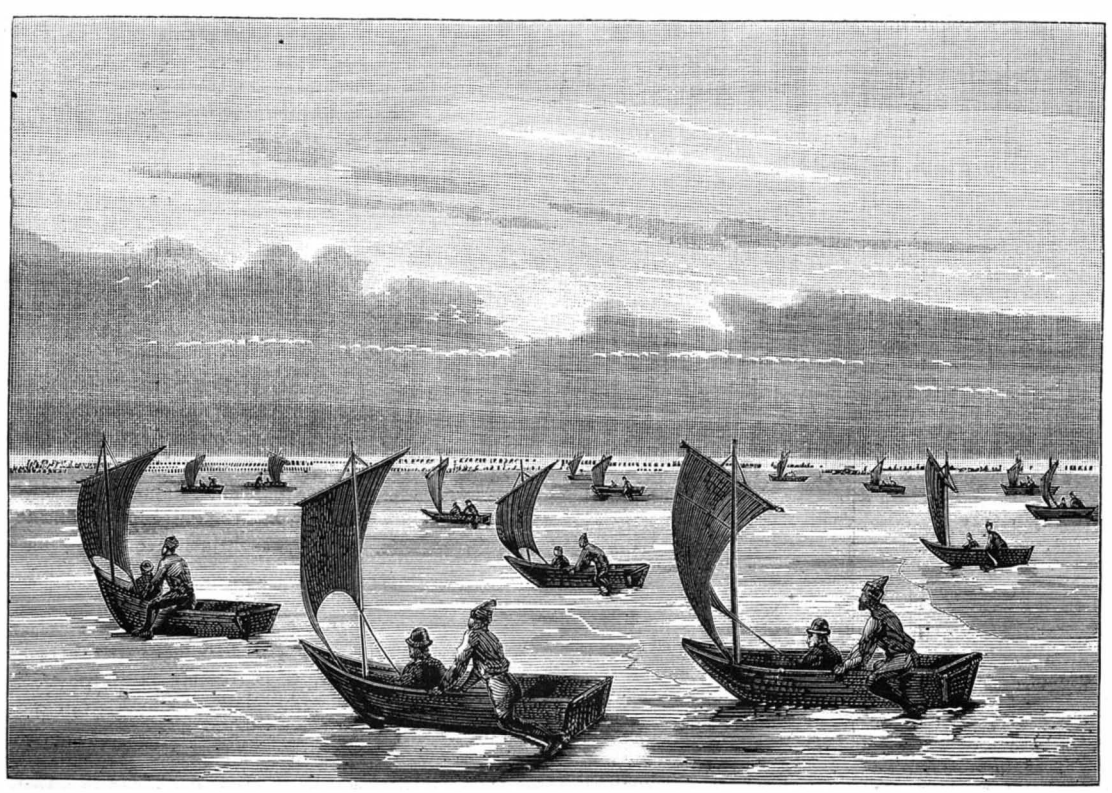
Sunday, August 27, everybody was astir, and omnibuses were filled with excursionists at the Place d'Armes, and set out one after the other for the coast at Esnandes, reaching it two hours afterward, during low tide. Here was seen an immense beach of slimy mud, on which it would have been impossible to venture without sinking in up to the waist. Yet it was necessary to cross this to reach the stakes that are planted at some distance out, and where the culture of mussels is carried on. For navigating this sea of mud the fishermen have devised a very ingenious process; this being the use of small flat-boats, called *accons*, that slide over the mud without sinking into it. In the middle of this boat they place the objects that they have to carry; in going, wooden poles or fagots for constructing the crawls, and in returning, the baskets filled with mussels. To move the accon forward over the mud they place themselves in the stern, with one leg hanging over the boat's side to serve as a propeller. By a series of energetic thrusts of the foot against the mud they cause the boat to glide along with great speed. When a visitor comes they place him in the middle of the accon, where he sits down on a little straw.

The fishermen are young and robust, and have acquired in this peculiar sort of work an uncommon skill. When the wind is favorable a small sail is hoisted in the bow of the accon, and this aids its running considerably. On the day of the visit to Esnandes it was curious to see the ocean of mud plowed by these little boats, each containing one—sometimes two—passengers squatting in the bottom, pushed along by long legs that successively bent and straightened after the manner of angle levers, and which served at once as boat hook and rudder. A few intrepid ladies likewise consented to participate in the excitement of this sort of navigation. It takes about half an hour to effect the crossing of the muddy beach. As soon as the ocean is reached the accon is shoved into the water and becomes a boat, which is maneuvered with either a pole or a wooden scoop serving as an oar. When the wind is favorable a sail is also used. The crawls are immense angles formed of stakes and handles, the base of which points toward the land and the apex seaward. A narrow aperture in the extremity of the angle, to receive nets or other apparatus to stop the fish at ebb tide, completes the crawl, and makes of it at once a mussel pen and a fishing place. It is here that the mussels are raised. It is asserted that this sort of culture extends back to the eleventh century.

"In 1035," says Mr. L. de Richemond, "an Irish bark ran aground at half a lieue from Esnandes. The master, named Walton, was the only one saved. Having settled in the country, he first invented the Allouret nets that serve for capturing the birds that sweep the surface of the water during the evening and night. To stretch these apparatus it was necessary to reach the center of the muddy beach. To effect this object Walton constructed the accon, a sort of boat from 2 to 3 meters in length and 50 centimeters in width, that was maneuvered by resting on one knee and propelling the boat with the other leg, which was incased in a long boot. In visiting his nets he perceived, one day, that the spawn of mussels had attached itself to the stakes, and that the shellfish thus developed in clear water were superior, as regards size and quality, to those that developed in the mud of the coast." It was then that he devised the crawls of which we have just spoken. Walton's invention was received with much favor. Following his example, others constructed crawls, and, without waiting for the mussel spawn to attach itself to the hurdles, it was collected on the coasts and carried to the inclosures prepared for it.

"At the same time," says Mr. De Quatrefages, in his "Souvenirs d'un Naturaliste," "the industry was perfected and systematized, so to speak, and each of its operations received a name, which, borrowed from another class of ideas entirely, might make one believe that two crawl owners when talking about their business were conversing about agriculture."

The small mussels hatched in spring are called "seed." They are scarcely larger than lentils up to near the end of May. Beginning with this epoch they grow rapidly, and, in July, attain the size of a kidney bean. At this time they take the name of "sets,"



MEMBERS OF THE FRENCH ASSOCIATION CARRIED TO THE MUSSEL CRAWLS IN ACCONS.

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and are fit for transplanting. To perform this latter operation, they are detached from the crawls in deepest water, and are placed in pockets made of old nets that are fixed on wickerwork not so far in the sea. The young mussels spread all around the pocket, and attach themselves thereto by the aid of filaments called byssus by naturalists. In measure as they grow and space begins to fail them, they are "thinned out" and "transplanted" on to new poles nearer and nearer the shore. Finally, the mussels that have acquired their full size and become salable are "planted" on the highest crawls. Here it is that the "crop" is gathered. Every day an enormous quantity of freshly gathered mussels is carried to La Rochelle, from whence shippers send them to Tours, Limoges, and Bordeaux.

Arrived at the fishery, the owner of a crawl gathers his crop, and returns laden with it at the rise of the tide, which carries him to the shore without difficulty. The crawls, which are now arranged in seven rows, and some of which are one kilometer from base to apex, occupy a space 10 kilometers in length by 4 in width.

The next excursion of the association was made on the 29th of August to Saintes, for the purpose of visiting the remarkable buildings, etc., at that place; but steady rain prevented any localities of interest being visited on the occasion. After partaking of a dinner here, the excursionists left by rail for Rochefort. Arriving there the association visited the arsenal, and afterward the port, where a torpedo boat was made to explode, under water, an apparatus charged with guncotton, which shot into the air a column of water 20 meters in height. Afterward, there were visited the iron-clad Tonnant, now in course of construction, and the military hospital. In the evening, after dinner, a reception at the Hôtel de Ville wound up a very interesting day.

The final excursion, which was made on the 1st and 2d of September, to Royan and Ile de Ré, was, like the ones just mentioned, full of interest.—*La Nature.*

Petroleum in Missouri.

Very promising discoveries of petroleum are reported in Vernon County, Missouri, where shallow wells had been sunk by persons prospecting for asphaltum. The supposed asphaltum, which in places covered the ground to a depth of four or five inches, has been pronounced by oil experts to be heavy petroleum. It is described as of a blackish green color, and of the consistency of thick molasses. The region in which petroleum is supposed to exist in quantity is a plateau about 5,000 feet above the level of the sea, lying near the center of a spur of the Ozark Mountains and between two arms of Clear Creek. The soil is of a silicious nature, yet so finely decomposed that it is admirable for farming purposes. Beneath the soil there is a thin stratum of clay which rests on a layer of argillaceous rock. Underneath this rock is a stratum of porous sandstone from 20 to 40 feet thick. Next comes a thin vein of coal, and beneath that is the oil deposit. The wells that were sunk in the search for asphaltum are from 25 to 40 feet in depth. Arrangements are making for the sinking of deep wells.

Turkey-Red from Alizarine.

Fifty grammes turkish-red oil are dissolved in 1,400 c. c. water, 15 grammes of 22 per cent alizarine added, also 0·2 grain of tannin. The mixture is then slowly heated to boiling temperature, and 60 c. c. are added of a solution of aluminum sulphite of 1·1014 specific gravity, which has been previously mixed with 22 per cent of soda crystals. On prolonged boiling, the alizarine lake separates out, which is freed from excess of oil by washing with ether. It then forms a powder of splendid carmine red color, which is constant in the light, and is not attacked by dilute acids and alkalies. It still contains a certain quantity of oil, which cannot be removed by ether, but which causes the luster of the preparation. When mixed extremely well with water, the lake can be used for dyeing tissues in shades similar to those produced by eosine. By using other mordants than alumina, different shades can be obtained.—*A. Müller-Jacobs, Moskau.*

Zinc in Making Potash.

Numerous methods have been invented for converting the chloride of potassium into the more useful and hence more valuable carbonate. The latest is that of Wittgen and Cuno, in which zinc oxide, or its hydrate or carbonate, is added to a concentrated solution of potassium chloride, which is then subjected to the action of carbonic acid gas. A double carbonate of potassium and zinc is thrown down as a precipitate, while the zinc chloride remains in solution. The former is decomposed into its constituents by means of hot water, and the solution of carbonate of potash evaporated down. The zinc chloride solution still contains some potassium chloride and zinc dissolved as a bicarbonate. Upon evaporation of this solution, the carbonate of zinc separates first, and afterward the double chloride of potassium and zinc. The latter is separated into the two separate salts by dissolving and crystallizing. G. P.

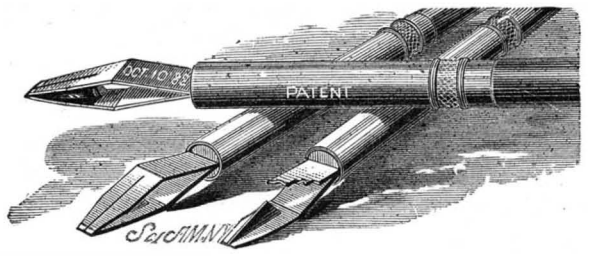
Salt in the Wyoming Valley.

An experimental well sunk for salt midway between the Warsaw and Wyoming wells (in Wyoming county, New York) has proved successful at the depth of 1,350 feet. This would indicate a wide extension of the Wyoming salt basin. The salt is exceedingly pure and in great quantity. The brine pumped is said to be nearly a third stronger than that of the Syracuse salt basin.

RECENT INVENTIONS.

New Shading Pen.

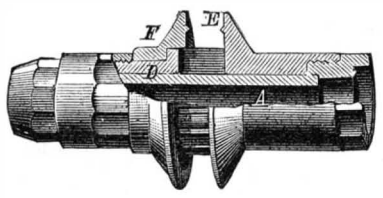
We give an engraving of a novel marking pen, called by the inventor "the chromatic," from the fact of its using two kinds of ink at once, the pen being provided with a longitudinal partition to prevent the mixing of the two inks. Each part of the pen is also made to put each kind of ink on the paper in delicately shaded lines, so that with



one stroke lettering may be made of two different colors that would be impossible with the old pen or a brush. The pen is especially adapted to lettering all kinds of show cards, notices, bulletins, signs, for making headings, etc. It is also excellent for writing mottoes, texts, etc. This invention was recently patented by Mr. J. W. Stoakes, of Milan, O.

Wagon Hub.

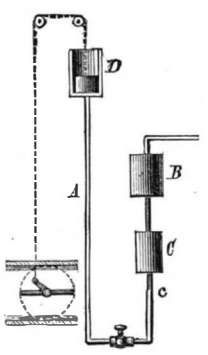
An improved hub for wagon or carriage wheels, shown in the annexed engraving, has been patented by Mr. John D. Torrence, of Vermilionville, La. A tapering axle box, A, provided at its inner end with enlargements for the collar on the axle, is screwed into a tubular core of the hub. It is provided at or near its middle with a ring of mortises, the separating partitions of which project above the surface of the core, so that the depth of the mortises will be greater than the thickness. The core is provided with a collar, E, forming the stationary end wall of the mortises, and having a height equal to about double their width. A



ring, F, is provided with a flange of the same outer circumference as the collar, E. This ring fits on the core, B, and the outer end of the core is threaded to receive a sleeve for holding the ring in place. A dust cap is screwed on the outer end of the core. The collar, E, and the flange of the ring, F, have annular sharp-edged projections on their inner surfaces. The tenons of the spokes are fitted into the mortises, one of the sides resting against the collar, E. The flange of the ring, F, is placed against the opposite surface, and is pressed firmly against the tenons by the screw sleeve on the core.

Draught Regulator.

We give an engraving of a device for automatically regulating dampers in steam boiler furnaces. It has been patented by Mr. Hippolyte Bisson, of Henderson, Minn. A pipe leading from the boiler is bent downward at right angles, and connected with a reservoir, B, in which steam is condensed to prevent direct contact of the steam with the mercury in a reservoir, C, below. From the reservoir, C, the pipe, *c*, is continued perpendicularly for a short distance and then turned horizontally, as shown; and in this portion is a cock for emptying the pipe and reservoirs of their contents. Beyond the cock, the pipe, A, is bent upward vertically, terminating in a reservoir, D, which is open at the top, and contains a float that is connected to the damper in the usual manner. When the pressure is up in the boiler it acts on the mercury, forcing it into the float chamber, raising the float, and permitting the damper to close by its own gravity. When the pressure is reduced the mercury flows back from the float reservoir, permitting the float to resume its normal position, opening the damper.

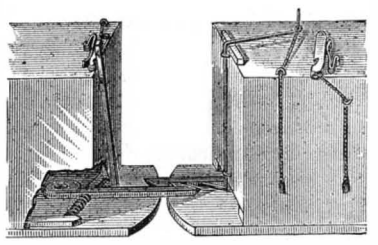


Insect Trap.

A trap for catching and destroying insects, shown in the annexed engraving, has been patented by Mr. William L. Waddy, of Peytona, Ky. Conical plates are provided with apertures in the middle, and are united by radial plates in such a manner that the cones project toward each other, and a short chimney provided with a cap is attached to the top of the device. The conical and radial plates are all made of reflecting material, so that a flame placed in the central aperture of the reflector will be reflected multifold, and a brilliant light will be produced. The insects are attracted to this light and rush to it, and strike the reflectors and drop upon the flame and are destroyed.

Car Coupling.

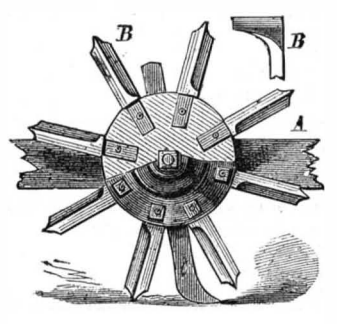
The accompanying engraving shows a car coupling which has been patented by Messrs. John W. Allen and Ashley B. Poynor, both of Franklin, Tenn. The draw bar of the car is connected to the frame in the usual manner, and is recessed to receive the shank of a coupling hook, which is pivoted to the draw bar by a bolt, and the forward or hook end of the coupling projects so far that it will readily engage the coupling hook on an adjacent car. The outer ends of the hooks are beveled upon their inner sides, so that they will slide past and engage with each other automatically as two cars are run together,



and they are also beveled upon their lower sides, so that they will slide readily upon the draw bars. The hooks are pressed forward to cause them to engage with each other by spiral springs attached to the draw bars and pressing against the hooks. The hooks are forced back to uncouple the cars by levers pivoted to the front end of the car, one arm of which rests against the forward side of the hooks, while the other projects over the top of the car. To this lever a cord is attached to operate it from the side of the car.

A Revolving Stalk Cutter for Plows.

The engraving represents a novel device for attaching to plow beams in front of the plow to cut the stalks and other rubbish that come before the plow when in use. A is a plow beam, having a colter, C, attached to it by two bolts, one above and the other below the beam. The bolts pass through the colter and a bar placed upon the opposite side of the beam from the colter, and have nuts screwed on their outer ends. The heads of the bolts are countersunk in the colter. A bolt which passes through the colter, midway between the yoke bolts, is countersunk in the inner side of the colter, and upon it is placed a hub that is secured in its place by a washer and nut, so that it will be free to revolve upon the bolt. In the inner end of the hub are formed radial sockets, into which are fitted the shanks of radial knives, B, secured in place by bolts countersunk into and passing through the knives and the hub, the outer surfaces of the knives being flush with the surface of the hub, so that the knives and hub can work close to the colter. The outer ends of the knives are tapered to an edge, so that they will take firm hold upon the ground, and thus rotate the hub, causing the successive knives to operate in connection with the colter as shears to cut stalks or rubbish. This device has been patented by Mr. Albert A. Kellogg, of Chamois, Mo.



Walking Stool for Children.

The engraving shows a new walking stool for the use of children when learning to walk. Such stools have been made with a ring-shaped top supported upon legs, and they have been used by placing the child's feet foremost through the top of the stool. This invention avoids this trouble by having a ring formed with a hinged section between two of the legs, so that the section may be swung outward. The section rests at the ends upon two of the legs, and is provided at its under side with a sliding bolt, for retaining the segment in its closed position. In the lower ends of the legs are balls provided with stems or shanks entering holes in the bottoms of the legs, so that the balls can be readily adjusted to vary the height of the stool to suit the child. The child can be readily placed within the ring by swinging out the removable section, and when the child is in place the section is closed and fastened. This avoids the necessity of placing the child in the ring feet foremost, and avoids the risk of injuring or breaking its limbs. The invention has been patented by Mr. Gustav Peterson, of Galveston, Texas.

A SHIP BURST BY WET RICE.—The Italian ship Francesca, laden with rice, sprang a leak and put into port at East London, May 11. She was promptly pumped out and a large force of men were set to work to unload her. The rice was in bags and the work was pushed with all speed; yet the wet rice swelled so rapidly that the ship was violently burst asunder May 13.

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ENGINEERING INVENTIONS.

Mr. James Mallen, of Wellsville, O., has patented an improved pulley for driving light machinery. A pulley made in skeleton form is keyed to the shaft, and a loose pulley consisting of a tire like band surrounds it and revolves in the same plane. On the inside of the band are notches that are right angled on one side and inclined on the other, into which radial arms are forced by means of levers, and a sliding collar on the shaft to attach it to the fixed pulleys. Lateral displacement is prevented by lugs on the fast pulley.

An improved device for heating cars has been patented by Mr. James M. Thayer, of Randolph, Mass. A furnace is held in a box suspended from the bottom of the car, and in the top of the box are registers through which the heat passes into the car. Around the furnace is a water space with which hot water heating pipes are connected that pass around the car and are connected with a supply tank that also serves as a condenser.

A device for holding car coupling links in such a manner that the links can be passed into the drawhead without endangering the hands of the brakeman has been patented by Mr. Frank Sweetland, of Edwardsburg, Mich. The device consists of a plate having a hand slot at its upper end, and below this a slot through which the coupling link is passed. A key fitting into part of the slot adapts it to be enlarged to admit a link having its sides pressed together at the middle, and decreased in size to retain the link. By this plate the link is guided into the drawhead.

An apparatus to prevent the accumulation of scale or sediment in boilers has been patented by Mr. William Ord, of Brooklyn, O. A brush of steel or other suitable material, shaped to conform to the interior surface of the boiler, is hung in the boiler on the ends of two wires that pass to the outside through opposite ends of the boiler, and connect to rollers, by which the brush is drawn backward and forward on the inner surface, to loosen the sediment and carry it to the mud drum. A heel attached to one side of the brush prevents its working when it is drawn to the front.

An apparatus for deepening the channels of rivers and removing sand bars where the tides are strong, has been patented by Mr. Gustav Peterson, of Galveston, Texas. The apparatus consists of a rotating drum provided on its periphery with spading devices. The ends of the shaft of the drum are journaled in bearers to each end of which a drag chain is secured. Behind the drum and connected to it by chains is a drag constructed similar to the ordinary square harrow. The apparatus is dragged over the surface to be removed, spading and loosening it, so that it may be removed by the current of the water.

Messrs. Frank S. Anderson and Charles Sauer, of Easton, Md., have patented a combined feed water and low water alarm for steam boilers. The device is so constructed that when the water is above its proper height the injector is shut off, and when it falls again is let on to feed the boiler. If the injector should fail from any cause to work, and the water level is brought down below the safety point, a whistle valve is opened and the whistle blown.

Mr. Henry Webster, of Cassville, Wis., has patented an improved manner of feeding water to steam boilers, by which better circulation is obtained. The feed water pipe enters one side of the rear end of the boiler, and passes forward to the front end, thence across it and back part of the length of the boiler, thence again nearly to the front and vertically downward, terminating just above the bottom of the boiler at the portion over the furnace most highly heated. By discharging the water at this hottest point, the impurities become finely granulated and do not form scale.

Mr. James H. Gamble, of Nebo, Ill., has patented improvements in safety switches for railroads, adapted to be operated by hand or automatically. The rails of the switch are spring rails, each secured at one end to the sleepers of the main track, their opposite bevel ends resting on the track sleepers, but are free to vibrate, one of the switch rails forming a continuation of one of the main rails and the other of one of the switch rails. The switch rails are connected by a rod, and are thrown to switch by devices on the cow catcher of the locomotive, and are released by a device on the rear car of the train.

Mr. Charles M. Emeis, of Mount Joy, Ia., has patented improvements in traction wheels for road engines by which the slip of the wheels and consequent waste of power in the engine is prevented. In the tread of the wheel spiked arms are fitted so as to be adjusted by devices secured to the hub of the wheel to project more or less for varying the tractive effect, or withdrawn entirely as desired. By suitable devices the spiked arms may be fully projected or withdrawn, or in any intermediate position.

Improvements in rotary engines have been patented by Mr. Thomas Hawkins, of San Francisco, Cal. A revolving cylinder is formed with radial grooves in which are sliding pistons that are projected against the inner surface of the case by springs. The cylinder is smaller than the interior of the case, leaving a steam way around it that is uniform in width a part of the way, and from the steam port then increases in width to exhaust port, the steam being used under high pressure in the narrow chamber, and expansively in the large chamber.

A traction wheel for road and other analogous engines, having an elastic connection between the running wheel and the gear wheel, for overcoming the strain of vertical jolts, has been patented by Mr. Abraham O. Frick, of Waynesborough, Pa. The running wheel and the gear wheel each have separate axles or bearings, and springs are interposed between the axles and bearings, and the sides of the two wheels are connected by elastic links that permit both vertical and rotary play to the wheels and bearings.

An improvement in car couplings has recently been patented by Mr. Charles E Macarthy, of Forsyth, Ga. This invention relates to an improvement in automatic car couplings, designed principally to hold the ordinary link in horizontal position favorable for automatic coupling.

An improvement in elevated railroad construction has been patented by Mr. Norman Allen, of Rockaway Beach, N. Y. This invention relates to the uprights or posts which support the superstructure of elevated railroads, and it consists in a walling for surrounding the ballast, made conical and adapted to be used with a lower sheet, also in a pedestal or base part of the post, formed with horizontal intermediate flanges and the vertical flanges.

An improved spark arrester has been patented by Mr. John H. Optenberg, of Oshkosh, Wis. This is an arrangement of a wire screen guard, deflectors, pockets, and draught-regulators, which effectually prevent the escape of sparks from the smoke-pipe of a locomotive or other boiler furnace, especially when artificial draught is employed to accelerate the combustion.

Mr. Clemens von Bechtolsheim, of Munich, Germany, has patented an improved direct-acting rotary engine for steam, compressed air, water, etc., devoid of the defects of the usual rotary engines, such as leakage, undue friction, overheating of the parts, and jerking movements. The engine is constructed with rotary cylinders having their inner ends resting against a valve trunnion or pivot.

A novel car brake and starter has been patented by Mr. Isidore Gérard, of Newton, Kan. This invention relates to improvements in devices for assisting the horses to start street cars; and it consists in the arrangement of a coil spring and two ratchets placed on the axle and contrived so that the stopping of the car by the resistance of the spring stores up power to be given out in starting the car.

An improved spark arrester has been patented by Mr. George Green, of Toyah, Texas. This invention consists of an inverted hollow cone suspended within a hollow and flaring receiver for the sparks, located in the upper and enlarged portion of the smoke pipe, to deflect the sparks against a conical annular cover to the receiver. By this means the sparks are broken and thrown against an arrester located over the hollow cone, and by the latter the sparks are again broken and then thrown down through the cone, to be returned as before, and continued in that course until extinguished and broken sufficiently to pass away with the smoke.

An improved car coupling has been patented by Mr. Samuel A. V. Hartwell, of Valley Center, Kan. The invention consists in a car coupling constructed with a bar hinged in the interior of the drawhead in such a position that its forward end will rest upon the rear end of the coupling link, and connected by a short bar with a lever hinged beneath the drawhead, and having a crossbar attached to its forward end, so that the link can be controlled from the side of the track.

MECHANICAL INVENTIONS.

Mr. George Dietzel, of New York city, has patented an improved machine for making beaded chenille, or chenille with a varying diameter. The invention consists in the combination of a laterally-reciprocating pile-cutting knife with a cam for reciprocating the knife as the pattern of the chenille may require, and means for operating the cam.

A novel saw sharpening machine has been patented by Mr. Charles M. Elkins, of Matteawan, and Wilbur H. Weston, of Newburg, N. Y. The device is adapted to be attached to a bench or other stationary object, and is composed mainly of two jaws for clamping the blade of the saw, and of a longitudinally-sliding and laterally-traveling or movable handle for holding and operating the file, the handle being axially adjustable for giving the proper stand to the file, and is pivoted so that it may be adjusted horizontally for filing both sides of the teeth of the saw, graduations being provided for setting the handle so that both sides of the teeth may be beveled alike.

An improved aligner for type-writers has been patented by Mr. Charles J. Baker, of Topeka, Kan. This invention consists of a gauge constructed and arranged for temporary attachment to the top of a type-writer, so as to occupy a position in such relation to the point where the type take effect on the paper in operation that the type may be successively raised up to said point and accurately and uniformly aligned in adjusting them, the gauge being essentially a bar of metal bridging over the type basket and resting on the type-writer case, with an opening at the type center, in which slides for the type, also having openings and being suitably cross-lined, are fitted to adjust the type by.

Mr. Charles J. Gibson, of Bergen Point, N. J., has patented an improvement in that class of lawn-mowers having spirally arranged cutters revolving about a horizontal axis. This machine possesses several points of novelty, which increase its effectiveness and durabilty.

A machine for making split keys has been patented by Mr. Robert T. King, of Columbus, O. This is an improvement on a machine for bending split metal keys, patented by the same inventor September 6, 1881, and it consists mainly in the substitution for hand levers of revolving cams which communicate power to the levers actuating the forming pin, and to a slide which operates the bending-levers.

MISCELLANEOUS INVENTIONS.

A new switch for grounding telephone or telegraph lines has been patented by Messrs. Benjamin McCabe, Charles R. Swain, and James T. Sutton, of Peekskill, N. Y. The object of this invention is to prevent telephone and telegraph instruments from being injured by electricity discharged from the clouds during thunder storms. It is constructed with a series of conductors and springs connected with the ground wire, a series of conductors and springs connected with the instrument wires, and a series of conductors attached to a sliding bar and connected with the line wires, so that the line wires can be connected with the ground wire or the instrument wires by a single movement.

A new and simple device for holding reins securely has been patented by Mr. Leslie R. Hyde, of Montague, Tex. Two cuniform sleeves are mounted loosely and eccentrically on two upright shafts that are inclined toward each other at the bottom and have spiral grooves into which pins in the sleeves pass. These parts engage with each other and move simultaneously. The reins are placed between the sleeves, and when drawn forward are grasped firmly.

Mr. James W. Patterson, of Philadephia, Pa., has patented a trunk frame that combines lightness and durability. The frame is constructed of metal bars connected by diagonal rods, all held together by corner pieces. The frame and lid are covered with a layer of wire netting, and the netting is covered with an external layer of canvas oilcloth or other waterproof material. This frame will not be damaged as a wooden frame by rough handling.

An improvement in gang sawing machines, by which they are adapted to saw curved timbers, has been patented by Mr. Charles S. King, of Houtzdale, Pa. The saws and feed rollers are operated in the usual manner. A pattern made of the exact curve required in the timber is placed upon the feed rolls. The sides of log are slabbed to the required thickness, and the timber is firmly secured upon the pattern. The pattern is guided in the required curve by rollers which rest against its concave and convex sides. By this means the timber is sawed accurately and as rapidly as the straight sides.

Improvements in door latches have been patented by Mr. John Brownlee, of Evansville, Ind. The latch slides and rotates in apertures in the forward end of the case, and in a partition near the rear end, and is held forward by a spring. The knob spindle passes through the case, and a cam block that is operated to move the latch back by turning the knob. Upon the side of the knob spindle are formed teeth, which mesh in teeth formed on the surface of the latch. A pin works against a spiral shoulder in the latch, and by pulling the knob spindle the latch is rotated and moved back.

Mr. James M. Harvey, of Palmyra, Tenn., has recently patented an improved shingle shaving machine. The shingles are cut from the shingle bolt by means of a riving knife placed in a vertical sliding frame operated by cam devices, the shingle block being turned a little at each cut to make the shingles thick at one end and thin at the other. After being cut the shingles are placed on a platform and held by suitable devices, while a shaving knife is drawn over them, the backward motion of the knife releasing the holding devices to free the shingle.

Mr. Henry C. Keeler, of Council Bluffs, Ia., has patented improvements in lifting jacks. The frame consists of parallel uprights placed on a support, and provided with slotted plates having notched projections on their edges, with which pendent pawls of a rocking lever engage to raise or lower a standard to which the rocking lever is pivoted. The pawls are held to the notched projections by means of springs attached to the lever. The standard carries the load to be raised.

Improvements in devices for packing dried fish have been patented by Mr. James H. Baxter, of Portland, Me. Moulds having a cylindrical contour on their interior are made in two longitudinal sections, and hinged together at one side. These sections have corresponding transverse internal grooves for the reception of binding cords. The fish are placed in the mould and the mould placed under a press. The mould is held together by hooks and removed from the press to tie the springs.

A faucet whereby ale or beer is so interrupted and agitated in its passage as to produce an increased amount of foam has been patented by Mr. Joseph H. Dorgan, of Plattsburg, N. Y. The outer end of the body is formed with a stuffing box through which the valve rod moves, the lower end of which is provided with a valve that is seated in the body. Below the valve seat the body is enlarged, forming an inward projection, against which the ale strikes, and also against the valve and valve seat, causing it to be agitated and form foam.

Mr. Charles B. Quick, of Penn Yan, N. Y., has patented a device for warming peanuts. A hollow cylindrical case is fitted in its lower portion to receive a lamp, and in its upper portion with a removable pan, upon which the nuts are placed. A perforated tube is fitted over an aperture in the center of the pan, and beneath the aperture and over the lamp is a deflecting plate that distributes the heat of the lamp over the surface of the pan to warm the nuts.

A machine for bending wooden stirrups has been patented by Mr. John B. Chiles, of Kernstown, Va. A former-block, over which the stirrup is to be bent, is provided, and the steamed block is pressed against the bottom of the former by a foot lever. By suitable devices operated by a crank shaft the block is pressed around the former-block to fit it, and it is secured by a clamp to retain it in shape, when it is removed to make place for another block.

Water boilers are usually fitted with rings in their ends for the attachment of pipes. Mr. John Trageser has patented a device by which they are attached in a quick and inexpensive manner. The aperture in the boiler is made slightly elliptic in form, and the ring fits closely across the shortest diameter. The ring is heated and placed in the aperture into which it is swaged to fill the aperture by means of a suitable mandrel and die. The shape of the aperture prevents the ring from turning in cutting the thread.

Mr. Justus M. Silliman, of Easton, Pa., has patented an improved instrument for projection drawing. A rectangular frame adapted to rest flat upon a drawing board is provided with graduated scales at its top and bottom edges, and has two quadrant-shaped graduated frames for crystallographic drawing. To the upper side of this frame two wires are attached that pass around a roller reduced at its center to receive a tension spring that holds the wires taut, so that the upper and lower edges of the drawing frame will be parallel with the winding roller.

Mr. Noble A. Boies, of East Palestine, O., has patented a device to be used with horses having vicious habits, to allow them to be successfully worked. The device consists of a safety bar attached to the bridle of the horse, and hooked at the other end to an eye upon the pole or shaft a suitable distance from the forward end. For a single horse one bar is placed on each side.

Improvements in baggage checks and clasps have been patented by Mr. James H. McLeary, of San Antonio, Tex. The check consists of a shell having a circular chamber and an elliptical opening leading to the chamber. A destination plate of elliptical form is adapted to be inserted into the chamber through the opening, and turned to cross the opening, so that a wire that secures the check to the baggage, and passes through the check, also passes through the plate. A duplicate of the destination plate is given to the bag gage owner.

Improvements in ironing boards upon which shirts are ironed have been patented by Mr. David McArthur, of Oswego, Kan. The body portion of the board is cut away at its upper end to form a head, and through the head an elastic cord is passed, the outer ends of which are attached to the shoulder portions of the board, the cord stretching the neck and upper part of the bosom, so as to be free of wrinkles. At the lower end of the board is a hinged tail piece, by which th lower end of the shirt is grasped to stretch the lowe part of the bosom.

Mr. Alexander J. Young, of Atlanta, Ga., has patented an attachment for ordinary hand lanterns that enables it to be used for giving danger or other signals. A hollow cylinder, in the ends of which a winding shaft is journaled, is secured in an upright position on the frame of the lantern. A screen composed of any suitable translucent material, and of a color employed to indicate danger, is wound on the shaft, and when it is desired to give a signal the screen is drawn out through a slot in the cylinder and around the body of the lantern.

A barrel hoop, having an elastic connection between its ends, by which the hoop may expand when the barrel swells, and contract when it shrinks, has been patented by Mr. Quincy King, of Colorado Springs, Col. The connection consists of a rod of spring metal, bent forward and backward on itself to form a series of loops, and connected at its ends by hooking them through loops in the end of the hoop. Mr. King has also patented an elastic saddle girth. Between the strap that connects the girth to the saddle and the girth proper is an elastic section, formed by bending a spring rod or wire in a series of loops, the loops being properly formed for attaching to the girth a strap.

A sanitary steaming stove for destroying human parasites, with their eggs and larva, in clothing, and also to disinfect and destroy the germ-spores of infectious diseases, has been patented by Mr. Henry Cartwright, of Portland, Or. Over a furnace is placed an evaporating pan, which in turn is covered with a steam-tight casement provided with doors. A rack lining made of wood laths is provided with hooks from which the clothing is suspended. Water is supplied to the pan, and a charge of clothing is steamed for ten or fifteen minutes.

Mr. William McCaine, of St. Paul, Minn., has patented an improved pyroxyline compound. The pyroxyline is combined with the essential oil of cassia or cinnamon, and a portion of the oil always remains in the compound and acts as a solvent of the solidified collodion at any time when it is exposed to heat, making it possible to take separate pieces after they become hard, and under heat and pressure to form them into one solid homogeneous mass.

Mr. Elvearo Stout, of Ottumna, Ia., has patented improvements in refrigerators. The ice chamber is in the upper part of the case, and the bottom of the chamber is perforated to permit the water from the ice to fall into a pan which forms the top of the provision chamber. The water passes through a series of water spaces that form the shelves or chambers of the refrigerator, the shelves or spaces being a little inclined so that the water runs across them to vertical spaces that connect them at their ends, and passes out at the bottom of the refrigerator.

Improvements in portable fences have been patented by Mr. William C. Gholson, of La Grange, Ga. The fence panel is made of two or more longitudinal bars having at each end two upright bars, between which the other bars are placed. One of the uprights is wider than the other, and projects slightly beyond the panel, so that the panels when placed end to end form a worm fence. The panels rest on the ground, and are held together by means of wires that are long enough to connect four panels, and placed in the spaces between the upright bars. The wires are provided at each end with a block upon which they are wound to tighten them to stiffen the fence.

Mr. Nathaniel B. Sollers, of Cove Point, Md., has patented a knitting board for manufacturing nets. The board is nearly semicircular in form and is provided with a perforation near its lower end and a block on its under side by which it is steadily held in the hand. A loop holder is secured to the face of the board that is so formed that the loops or meshes are easily placed on it, and will not slip off in use. The net is secured to some stationary object, and the board holds the meshes taut while the shuttle is passed through them.

Mr. Cornelius Kunkel, of Oregon, Mo., has patented improvements in windmills, consisting of auxiliary vanes applied to the windmill in such a manner as to counterbalance the tendency of the wind to change the angle of the wings of the wind wheel, so that a governor employed to regulate the position of the wings will be relieved of the work of holding the wings to the wind.

A light and convenient device for gumming cross-cut saws has been patented by Mr. Clarence A. Stafford, of Norwood, Mich. Die blocks adapted to move between two plates are moved by two cam levers that are so pivoted to the die blocks and plates that when they are swung apart they act simultaneously to move the blocks. The saw plate is entered between the dies, and when the levers are pressed, the leverage being powerful, the cutters act with precision.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Machine Tools.—We now have in stock, ready for instant delivery, part at our N. Y. warerooms and a portion at our works, Manchester, N. H., the following new machine tools, which we offer at the below-named exceptional prices. All modern, latest patterns, lathes, screw cutting, rod feed, power cross feed, 20 in. and under, with hollow spindle. 14 and 16 ft. x 26 in., with compound rest. viz.: Engine Lathes.—2-16 ft. x 26 in.. $786 each; 3-14 ft. x 26 in., $750 ea.; 1-16 ft. x 20 in., compound rest, $522; 2-10 ft. x 20 in., $449 ea.; 2-8 ft. x 20 in., $425 ea.; 1-12 ft. x 18 in., compound rest, $455; 2-12 ft. x 18 in., $435 ea.; 2-10 ft. x 18 in., $415 ea.; 3-8 ft. x 18 in., $395 ea.; 3-6 ft. x 18 in., $375 ea.; 1-7 ft. x 17 in., $359; 1-6 ft. x 17 in., $350. Drill Presses.—2-32 in. back geared and self feed, $965 ea.; 1-30 in., back geared, $325; 2-28 in., back geared, $280 ea.; 2-24 in., $185 ea.; 3-20 in., $150 ea.; 2-18 in. $110 ea. Iron Planers.—7 ft. x 32 in. x 25 in., $775; 4½ ft. x 2½ ft. sq., $575; 4 ft. x 24 in. sq., $500. Heavy combined punch and shear, $950; 15 in. shaper, $450; 6 in. shaper, $135; milling machine, $225; 48 in. radial drill, $750; No. 1-7 spindle Durrell nut tapper, $300; No. 2-7 spindle Durrell nut tapper, $350. In addition we have an immense assortment of new and second-hand machine tools, engines, boilers, and pumps, woodworking and general machinery; fully described in our catalogues 29, 30, and 31, which we mail free on application. S. C. Forsaith & Co., machinists and general machine dealers, Manchester, N. H., and 209 Center St., New York city.

Hand Saw Manufacturers address John E. Tyler, Roxobel, Bertie Co., N. C.

Water Motor and Electric Light Machinery for sale at a low price. See advertisement on page 284.

I will invest in a good thing, part or whole. Address, with particulars, or no answer, 21 Park Row, Box 357, N.Y.

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American Fruit Drier. Free Pamphlet. See ad., p. 270.

Am. Twist Drill Co., Meredith, N. H., make Pat. Chuck Jaws, Emery Wheels, Grinders, automatic Knife Grinders.

Fire Brick. Tile, and Clay Retorts, all shapes. Bornerg & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv., page 268.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Drop Forgings. Billings & Spencer Co. See adv., p. 270.

Brass & Copper in sheets, wire & blanks. See ad. p. 269.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

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Improved Skinner Portable Engines. Erie, Pa.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 270.

Trevor's Patent Key Seat Cutter. Trevor & Co., Lockport, N. Y. See page 269.

Lubricator. See advt., Detroit Lubricator Co., p. 252,

Engines, 10 to 50 horse power, complete, with governor. $250 to $550. Satisfaction guaranteed. Nearly seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Pat's Mfg'd on royalty. A. B. McCool, Pottsville, Pa.

The Sweetland Chuck. See illus. adv., p. 254.

Steam Pumps. See adv. Smith, Vaile & Co., p. 252.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

Calcium Light Apparatus and Stereopticons at low prices. C. Beseler, 218 Centre Street, New York.

Bostwick's Giant Riding Saw Machine, adv., page 238.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 236.

See New American File Co.'s Advertisement, p. 238.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 238.

25″ Lathes of the best design. G. A. Ohl & Co., East Newark, N. J.

Red Jacket Adjustable Force Pump. See adv., p. 220.

Collection of Ornaments.—A book containing over 1,000 different designs, such as Crests, Coats of Arms, Vignettes, Scrolls, Corners, etc., will be mailed free on receipt of $1. Address Palm & Fechteler, 6 West 14th Street, New York.

Combination Roll and Rubber Co., 68 Warren street, N. Y. Wringer Rolls and Moulded Goods Specialties.

Pure Water furnished Cities, Paper Mills, Laundries, Steam Boilers, etc., by the Multifold System of the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

NEW BOOKS AND PUBLICATIONS.

A SUPPLEMENT TO GRIMSHAW ON SAWS. By Robt. Grimshaw. Philadelphia: E. Claxton & Co. 8vo, cl. pp. 120. $2.

The first part of Mr. Grimshaw's work was noticed in these columns some months ago. The new part contains material, chiefly relating to saw blades, which has come to hand since 1880. The new illustrations number about a hundred.

CONSTITUTIONAL HISTORY AND POLITICAL DEVELOPMENT OF THE UNITED STATES. By Simon Sterne. New York: Cassell, Petter, Galpin & Co.

An unpretending work, sketching the development of American institutions in a matter-of-fact way, and discussing somewhat dryly the merits, faults, and failures of our political methods. While we cannot agree with the author on some disputed points of public policy we can heartily commend his work generally to popular favor. The information given should be of interest to every citizen.

FOR GIRLS: A SPECIAL PHYSIOLOGY. By Mr. E. R. Shepherd. New York: Fowler & Wells.

Most girls are allowed to go in ignorance of their special organs and functions, to pick up, sooner or later, by tradition or otherwise, an amount of misinformation not at all conducive to their physical and moral health. Even when formally taught anatomy and physiology the instruction always leaves out those matters about which correct knowledge is most needed. The author's aim is to present the lacking information in a wholesome way, and to supplement it with good advice touching personal hygiene, dress, conduct, and so on. The spirit of the little book is admirable, and its execution fairly good.

REPORT OF THE NEW YORK STATE SURVEY FOR 1880. James T. Gardiner, Director. Albany: Weed, Parsons & Co.

Describes the method of marking trigonometrical stations in the State Survey, and tabulates the approximate geographical positions of the stations of the central chain of primary triangles across the State. The survey finds existing maps exceedingly inaccurate. The most notable result of the year's work is the completion of the first accurate measurement across the State from the extreme western boundary, near Lake Erie, to the Massachusetts line. The width of the State between these points is 326·46 miles—2¼ miles less than the best maps make it. This makes a difference of from 300 to 400 square miles in the area of the State.

THE ODYSSEY OF HOMER. Done into English prose by S. H. Butcher and A. Lang. New York: Macmillan & Co. $1.00.

The translators' aim has been to make a truthful rendering of the story of Odysseus in simple English prose. The studied simplicity of the style adopted comports well with the story, though the language lacks at times the flexibility and rhythm of genuine English. As a faithful translation the work has been received with much favor in England, this edition being the third. The publishers' part is uncommonly well done for the price.

HISTORY OF WOMAN SUFFRAGE. Edited by Elizabeth Cady Stanton, Susan B. Anthony, and Matilda Joslyn Gage. Vol. II. New York: Fowler & Wells. 8vo., cl., pp. 952. $5.00.

The second volume of this monumental history of the efforts of women to secure for women legal and political rights corresponding to those of men, covers the period between 1861 and 1875. A considerable part of it is devoted to the national services rendered by women during the civil war. A third volume is promised in 1884.

A SOLUTION OF THE PYRAMID PROBLEM; OR PYRAMID DISCOVERIES, with a NEW THEORY AS TO THEIR ANCIENT USE. By Robert Ballard. New York: John Wiley & Sons.

The author writes as an engineer, and is curiously free from the religious, astrological, or other more or less fantastic whims of ordinary pyramid solvers. He presents with a good deal of cogency the theory that the pyramids were erected as a system of landmarks for the establishment and periodical readjustment of the land holdings of the people. The pyramid builders may have made the entombment of their kings one of their exoteric objects, he admits, thus playing on the morbid vanity of their rulers to induce them to the work; but their primary purpose was to make use of these structures in land surveying. The manner in which the pyramids may have been used as great theodolites, to be observed from a distance, is clearly shown.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) R. D. asks: Will you please inform me what is used to darken bronze? I have the bronze castings, and want to finish them like the bronze bell pulls and door trimmings we buy at the hardware stores. It is called dark or Berlin bronze. Also how to make a good lacquer for bronze? A. Cleanse the metal by dipping it first momentarily in nitric acid, then rinsing quickly in running water, and rubbing with sawdust. The bronzing dip may be prepared by dissolving in a gallon of hot water 1½ lb. each of perchloride of iron and perchloride of copper. The metal should not be allowed to remain in this dip any longer than is necessary to produce the desired color. Rinse well, dry, and polish in warm sawdust or with a rag buff. To make a bronze lacquer, dissolve ¾ lb. of shellac and ½ lb. sandarac in 3 quarts of alcohol, and add enough extract of dragon's blood and turmeric to produce the desired color.

(2) J. K. asks: Is there a way to prevent wood in the form of a box 4 ft. 6 in. x 20 in. from warping on change of temperature? A. The only remedy we know of is to use thoroughly seasoned wood, and to so construct the box that one part will restrain any tendency of another to warp by "dove-tailing," battening, or crossing the grain. There is nothing of a chemical nature that will prevent warping in wood.

(3) D. C. asks: 1. How is the bright brass plating applied to the cast iron buckles of suspenders? A. See "Electrometallurgy," in SUPPLEMENT No. 310.

(4) F. C. writes: After inserting a small gas pipe through some Scotch water gauge glasses, and letting them lie over night, I found several broken in the morning. Being told that it was caused by the iron touching the glass, I covered the gas pipe with paper, but with the same result. The breakage was not due to any strain, as the piping fits very loosely in the tubes. Could you give any reason for such results, and what I should do to prevent it? A. Scotch glass water gauge tubes, like other glass tubing, is not annealed, or may be only partially annealed, which leaves the glass with an uneven tension or strain; and from experiments made for testing these conditions, we are led to believe that the inner surface has a strain tending to pull it apart, and the outer surface has a strain of compression. These conditions are due to the unequal cooling of the two surfaces. The outside cooling the fastest, compresses the inner surface while it is plastic from heat, and then sets; the inner surface cooling last or slowest, continues to shrink after the outside is set, and thereby induces a tensional strain upon the inner surface. The facts that sustain this theory are these: you may scratch, file, or rub the outside of these glasses with impunity; but if you scratch the inside or touch it with anything that produces the least scratch, even if you cannot see it, the chances are that the tube will show the crack in a short time. These tubes can be cleaned with a small pine stick and cotton wad with safety; but if you undertake to clean them with a piece of iron pipe or rod covered with a peroxide scale that is almost as hard as emery, you can hardly expect better results than you have experienced. The paper that was put upon the iron tube may itself have had particles of grit or sand upon it, that produced an imperceptible scratch.

(5) H. O. writes: Will you please inform me of a varnish and the process of making it, that I could varnish some ornaments that I have bronzed with gold colored bronze? The method I used to put the bronze on was to paint the article, which is cast iron, with white paint, which is white lead and oil; when hard dry, varnish with copal varnish; when sticky dry, dust the bronze powder over it; and when hard dry, brush off all the superfluous bronze with a camel's hair brush. What I would like to know is how to protect it from the dust and from soiling. Is my process correct? A. Coat the bronzed surface, when dry, with spirit copal varnish. Your process is correct.

(6) C. S. asks: How is glucose manufactured? Do you think I could make it from sweet potatoes? What would it cost to make it on a small scale? A. You will find comprehensive papers on glucose and its production in SUPPLEMENTS, Nos. 96, 259, and 260. It can be prepared from the yam, but more profitably from corn or cassava.

(7) J. S. L. asks: What material (not acted on by caustic soda) can I use to make non-porous the lower portion of porous cell used in the "cheap electric pile," mentioned in SCIENTIFIC AMERICAN, Aug. 5, page 85? A. Try plaster of Paris, filled after "setting" with melted paraffine.

(8) G. A. F. asks: What will make the best oak stain to apply to pine finish, and how should it be applied? A. Tincture of turmeric (curcuma) five ounces; dragon's blood half an ounce; alcohol three pints. Rub up the dragon's blood to a thin paste, with a very small quantity of boiling water in a hot mortar, then add the alcohol, and finally the yellow tincture, mixing all well together. Let the mixture stand for eight hours in a covered vessel, and strain through a cotton cloth for use. Apply with a brush, adding wine spirit if too dark.

(9) W. A. M. writes: I have a rope, with hook attached, running over a pulley which I use for hoisting light packages of merchandise from the ground to the second and third floors of a building. The rope is exposed to sun and rain. Please tell me how to treat it so that it will not rot out, as I find the action of the weather soon destroys it. A. Digest the rope for several hours (or over night) in warm dead oil (a cheap product of the distillation of tar).

(10) J. B. writes: I am about to lay an iron pipe 10 inches diameter, made of plates about three-sixteenths of an inch thick, across the street underground to my boiler shop, for the purpose of transmitting blast to the forges. Will you kindly inform me through the medium of your paper what would be best to use in the way of paint to prevent injury to the pipe from rust or corrosion? A. Dissolve genuine asphaltum in oil of turpentine; give the pipe two good coats of this, allowing the first to dry before the second is applied. See that the pipes are quite dry before putting on the varnish.

(11) H. L. D. asks: Is there any remedy for falling hair, or any preparation that will cause a new growth of hair? also the cause of and how to remove dandruff? A. See "Hygiene of the Hair," by Prof. Erasmus Wilson, in SUPPLEMENT No. 102, and "Baldness," by Geo. H. Rohe, in SUPPLEMENT No. 161.

(12) A. H. J. asks: Can you suggest some way of making paper transparent? I have tried soaking it in machine oil with results not satisfactory. A. We know of no way of making paper transparent. It may be made translucent by saturating it with castor oil or bleached balsam.

(13) W. G. B. asks: Can you give me directions for putting a high polish on ebony, one that will be durable? A. Give the work two coats of fine copal varnish, and rub this down (when dry) quite smooth with fine pumice stone; put on a third coat of the same, and rub down with rotten stone; clean and put on a flowing coat of best spirit copal varnish, and when this has become quite dry, polish with chamois skin and the palm of the hand. 2. Also for a mixture to dye pine to a dark walnut color. A. Dissolve in a pint of water two ounces of sal soda, heat to boiling, add three ounces of bichromate of potash and eight ounces of Vandyke brown, with enough water to reduce to the proper consistency for use with a flat brush or rubber. Use the stain hot, and not too concentrated. This, when dry, takes varnish or oil very well.

(14) J. L. B. writes: In SCIENTIFIC AMERICAN of May 20, page 323, answer to J. H. Z., No. 22, you give receipt for starching collars, cuffs, etc. Allow me to ask: 1. Should the goods when starched be treated as when ordinary starch is used? A. Yes. 2. Do you mean a common sadiron when you say "use a polishing iron?" A. No; the polishing iron is usually smaller than the ordinary sadiron, and has all the face edges well rounded, so as to admit of a burnishing action, in which the full pressure is brought to bear on a small area, thus developing a *gloss* not easily obtainable by other means.

(15) H. C. asks: At what temperature the alloy, note 14, page 139, current volume, melts? A. At about 210° Fahr. The receipt should read: "lead 1½ parts, cadmium ½ part," etc.

(16) E. B. S. asks: Will you please tell me the best way to prepare the Irish potato for the purpose of cleaning, particularly for cloth and silk? A. The potatoes are simply washed and reduced to a fine pulp by grinding. See "Potatoes and their Utilization," page 229, vol. xlv.

(17) D. E. S. asks: 1. Can you tell me how much pressure a boiler made of 14 inch lap-welded wrought iron pipe will stand? Do you not think it would stand 500 pounds to the square inch? If not, how much will it stand? It is a good quality of pipe. A. We believe they are proved to only 300 pounds per square inch. Pipe can of course be made, and has been made, to stand much more than 500 pounds. 2. Do you think cast steel is as good for boiler heads as wrought iron, that is, to insert two-inch flues in? Will it expand more than wrought iron: I mean such as the Chester steel casting, as cast at Chester, Delaware Co., Pa.? Would it not make good heads for small 14 inch boilers with about twelve 2 inch flues? If not as good, is it not nearly as good? A. Yes, if soft or low steel, difference of expansion and contraction being very slight. 3. How much pressure will 2 or 2½ inch steam pipe stand, outside pressure, that is, used for flues? A. We do not know of actual tests, but it will stand much more than any pressure used ordinarily in steam boilers. Locomotives use pressures up to 150 to 200 pounds. 4. Do you think the heads could be put into 14 inch pipe so as to hold as much as any part? A. Yes, if properly done.

(18) J. E. D. asks: Can I use an upright tubular boiler for heating the room in which it stands, another adjoining on the same level, and one over both? The trouble I apprehend is to return the water from lower coils to the boiler. Could I warm lower rooms by flow of hot water, and upper one by steam? Can I run a small engine, say, four or five horse power, in a block of buildings in an unincorporated village without a licensed engineer? A. There would be difficulty in returning the water from coils on rooms and on the same floor as the boilers. The condensed water would have to be trapped into a cistern and pumped back into the boiler or returned by an injector We think that under the State law you must have a licensed engineer.

(19) G. N. asks: What is used by brass finishers to give that peculiar luster to their work? I have been told it was some kind of acid? A. The luster given to brass work other than by finishing and polishing is produced by acids and then lacquered. A

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good receipt for dipping cast brass is: equal parts by measure of sulphuric and nitric acid and water. The work must be cleaned with a strong hot solution of soda in water. Dip but a few seconds, and rinse in clean hot water; dry in sawdust.

(20) W. H. W. writes: I have some wood work painted zinc white. Can I ebonize it, and if so, please tell me the process? A. The white paint must first be removed by spirits of turpentine or aqua ammonia, and the wood treated with a hot concentrated solution of alum until it is saturated, when it is brushed over with a logwood decoction thus prepared: one part of fine logwood is boiled with ten of water, and filtered through linen, after which it is evaporated down slowly to one half; to every quart of this add from ten to fifteen drops of a saturated solution of indigo perfectly neutral. After rubbing this into the wood it is treated with a saturated and filtered solution of verdigris in hot concentrated acetic acid. This whole treatment is repeated once or twice until the required intensity is obtained.

(21) C. M. C. writes: We have tried most of the different kinds of wood for building steam boxes, and find that about two years is as long as any of them will last. Being compelled to renew them so frequently places a heavy tax on the business. Iron is being used by some for this purpose with very little better success. Kindly give me your opinion on how brick would answer? Boxes require to be about seven feet each way, and no connection between apartments. A. Steam boxes used here are made of wood. If you should thoroughly paint the wood with coal tar, such as is used for iron work, you would no doubt add one or two years to its life. Brick would not do unless treated with coal tar, as the hot steam disintegrates brick and mortar very rapidly. The best and most durable steam boxes that we know of are staved and hooped like cisterns or tanks.

(22) O. R. R. writes: Is the green scum which collects upon the surface of stagnant water a vegetable growth? I have thought that it might be a species of alga, and that it is a means provided by nature for purifying the water. Am I right: if so what is its name? A. The green scum is composed of conferva, chiefly the microscopic globular alga, called Clathrocystra æruginosa.

(23) H. A. O. asks: I get forty pounds of beef per week, and wish to keep it fresh so that it will not spoil. Could I keep it by sinking a barrel in a spring of water, high enough to come above the water? How can I keep the barrel from becoming damp inside? How can I cover it tightly? A. Your plan is a good one in the absence of a supply of ice The barrel should be tight and kept well down in the water. The meat may be suspended from hooks in the underside of the cover, the latter being well packed with woolen stuff so as to fit tightly and exclude the air. A little unslaked lime in the bottom of the barrel will absorb moisture. If the meat were immersed for a few minutes in Professor Barth's boroglyceride solution it might insure its keeping.

(24) W. J. P. requests a recipe for coloring brass black, something that will bear handling if possible. I have used a dip of butter of antimony, but the results obtained were not altogether satisfactory. Also mention a book containing such recipes? A. To color brass black try a weak solution of permanganate of potassium in very dilute nitric acid. "Spons' Receipts."

(25) A. S. L. asks: 1. How can the grease be prevented from collecting in the trap underneath the kitchen sink, thereby causing foul smells; and if not preventable, what is the most effective method to cleanse the trap? A. To prevent grease collecting in your sink pipe wash down the pipe every day with boiling hot water, which will melt the grease and carry it down to the sewer. If this does not entirely clear it, put some sal soda in the water and pour it slowly into the pipe boiling hot. 2. How can I take the stain from white marble occasioned by water in which flowers have been kept? A. For removing stains upon marble, wash the marble thoroughly with soda and warm water to remove any grease, and apply oxalic acid by laying a piece of white cotton cloth saturated upon the spots for a short time. If it destroys the polish you may repolish with oxide of tin and water applied with a cloth. If the stains are not deep rub the surface only with the oxalic acid and water upon a small piece of cloth quickly, and wash, to free the marble of acid. Then, to give it a gloss, rub with chalk wet with water.

(26) L. L. J. asks: 1. In extracting the coloring matter from a vegetable substance will the resulting liquid keep better whether the vegetable is boiled, or soaked in cold water and then subjected to pressure? A. The more matter dissolved the greater the tendency of the decoction to sour. 2. Also, please tell me of a good mordant for a black or dark brown vegetable dye, without any disagreeable smell or taste? The dye is to be used on vegetable matter, and the ordinary tannic acid adds a peculiar and unpleasant odor and taste. A. Nothing of this character is known. Copper or iron salts are generally used, but they are very perceptible to the taste.

(27) J. B. says: I have at my residence in the country just put in a water closet on the second floor, which, with my waste from the bath, I drain into a large well about twenty-five feet from the house. The said well is lined with dry stone, 18 inches thick, to within 4 feet of the surface, the 4 feet laid in mortar, and covered with 2 inch pine plank bedded in cement on the wall, joints calked, beside being firmly spiked to two pieces heavy timber crossing the well and built in the wall, making it quite hermetical, I think. Now, what I desire to know is, would it be proper to make a small hole in the cover to permit any gas or foul air generated therein to escape, and would it (if it did escape), not be offensive being so near the house, or would not such an opening have a tendency to drive the foul air or gas toward the water-closet above it? In short, which do you suggest as the better plan, to keep the well hermetically sealed, or make a hole in the same? A. If your house pipes are properly arranged there will be no driving back of foul air, whether you have an opening in the top of the cesspool or not. But such a receptacle as you describe is a bad thing to have near any dwelling, because by leakage into the adjacent ground it is all the time breeding a poisonous atmosphere. The opening you propose will not help the matter. If you are obliged to have a cesspool, then it should be made absolutely tight, like a bottle, so that there can never be leakage into the earth; it should be ventilated by a liberal pipe, leading to the top of your house; the contents should be removed by pump whenever required, and carted away. In addition to this your house pipes should be trapped and should be ventilated by pipes leading above the roof.

(28) T. E. H. asks: Please inform me of a good and simple way of cleaning and recoloring the barrels and other metal parts of a double barrel shot gun which are quite rusty? Would it be best to color or nickelplate the small parts? A. Take the barrels from the stock and put them in clean cold water free from gritty matters. Attach the brush to the washing rod, and get out all adhering powder and residues; next take tow and wash until the barrels are quite clean. If the parts have rusted it will be necessary to use a little emery flour. Dry the barrels with clean cotton rags, rubbing until the metal feels warm. Plug the ports and muzzles securely, then cleanse the outside parts with a strong alcoholic solution of caustic potash, aided, if necessary, with a little emery flour and a soft rag. Rinse thoroughly in water, dry thoroughly, warm, and while warm rub over every part with the following preparation: pure (dry) zinc chloride 1 oz.; nitrate of antimony ¼ oz.; olive oil 2 oz.; well rubbed down into a smooth uniform paste. After half an hour's exposure, rub off excess of this paste and polish with clean soft rags. In warming the metal avoid overheating it so as to injure the temper. Guns look nicely when properly electroplated with nickel, but ordinarily the coating is not very serviceable.

(29) E. G. S. asks: What are the difficulties attending the invention and use of a steam road carriage for common roads? A. The principal difficulty is to so "hang" the engine and boiler that the carriage may run in any direction or over obstacles, without affecting the joint and machinery connections. You would get much information by reading up the English experience with steam carriages.

(30) W. W. C. asks: 1. What the component parts are of the black paint used for school black boards? A. The following composition is recommended for black boards: shellac varnish, ½ gallon; lamp black, 5 oz.; powdered iron ore or emery in fine powder, 3 oz. If too thick thin down with alcohol. Give the wood three coats of the composition, allowing each to dry before putting on the next. The first coat may be of shellac and lamp black alone. 2. How can I mix a good glossy and durable green or red paint for wagons? A. Better lay on the color in oil and varnish over it. Vermilion or chrome green are good colors. You can purchase the colors ready ground in oil much more cheaply than you could mix them yourself. To obtain a smooth, glossy, or carriage finish apply several coats of the paint; let each dry thoroughly, then rub them down very smooth with fine pumice stone moistened with water, and finally lay on one or more coats of good copal varnish.

(31) D. C. asks: How can I make nitrate of copper, or where I can procure it? A. Some clean turnings of pure copper are placed in a glass or porcelain vessel, and nitric acid diluted, one part of acid to three of water poured upon it; the mixture is set aside out of doors to avoid the poisonous fumes evolved, and when the copper has entirely dissolved the solution is evaporated down in a porcelain dish until it is dry. The green salt thus obtained is the nitrate of copper. It is very corrosive to the skin and must be carefully handled. You can procure nitrate of copper from any large drug house.

(32) W. E. D. writes: Having read a recipe for making a black ink from nigrosine, I resolved to try it, but find that the ink will smear if accidentally rubbed by the hand, especially if the hand is moist. Would you please inform me how to obviate the difficulty? A Try the following: a concentrated solution of borax 1 part; shellac 4 parts; boiled together and mixed with sufficient nigrosine to give the requisite color.

(33) E. H. R. asks: How can I test amber beads for their purity? A. A small portion of oleic acid is dropped upon the lump and gently warmed. If the amber is spurious it will dissolve; or if adulterated, will be more or less reduced in size.

(34) J. G. asks how to make a cement that will be as hard as stone when dry, and which will adhere firmly to wood. A. Try the following receipt: Melt 1 oz. resin and 1 oz. of pure yellow wax in an iron pan, and thoroughly stir in 1 oz. of Venetian red, until a perfect mixture is formed, which is used while hot. When cold it is as hard as stone; or if the color and heating are objections, use a solution of soluble glass mixed with some quicklime.

(35) B. R. H. asks: Will you please give us receipts for canning sugar corn and tomatoes? A. To can tomatoes select well-ripened perfect fruit; clean, scald, and remove the skins and pack in the cans. It is preferred by many to remove at least one-third of the fluid portion of the fruit before packing. Put on the covers and immerse the cans in boiling water for from an hour to one and one-half hours. When taken out open a small vent (preferably not larger than a pin hole) in the head of each cover, and as soon as the confined air or gases have escaped seal up again and put the cans aside. In the course of a week examine the cans to see if they are tight. Corn is canned in a similar manner, but requires much longer heating to cure it properly: six hours' exposure is frequently required. If the water bath contains a solution of salt or chloride of calcium instead of pure water, the curing operation is facilitated and the curing more effectual. If not properly cured such goods will not keep, and the cans are apt to burst, by reason of the gases disengaged in the process of fermentation or decay. Care must therefore be taken to avoid accident in storing the cans.

(36) C. F. T. writes: 1. Sponge is porous and absorbs water and is increased in weight thereby. Does sponge absorb gas, such as oxygen or hydrogen? Would it become heavier or lighter by so doing? A. If the sponge is compressed into small compass and then allowed to expand in a gas, the latter will rush in to fill the interspaces and pores, just as water does under similar circumstances; there is no absorption of gas in any other sense. Sponge inflated with air or gas is slightly heavier than when compressed. Hydrogen is much lighter than atmospheric air, so that a sponge inflated with that gas would weigh less than when filled with air. 2. What weight will a cubic foot of confined air support or prevent from sinking in water? A. Atmospheric air varies slightly in volume with changes of temperature and barometric pressure. At 60° Fahr. and 30 inches barometric pressure, dry air is 813·67 times lighter than pure water. A cubic foot of pure water under like conditions weighs about 62½ pounds, and a cubic foot of air about 1⅛ ounces. The difference is the weight necessary to sink this volume of confined air in pure water. 3. What amount of confined air would prevent a human body (say one weighing about 150 pounds) from sinking in water? A. The specific gravity of the human body in life is nearly that of water. To support the head out of still water 100 cubic inches of air in a light envelope will suffice. A larger volume would be necessary in rough water.

(37) D. H. asks: Can you tell me the quickest method for tanning thin rawhide regardless of the quantity of the leather after it is tanned? A. Put the washed hide into milk of lime until the hair comes out easily, then rinse, pull the hair out, and with a blunt knife remove the fatty integuments from the flesh side, and having cleaned the hair side, put the skin into a strong, warm decoction of extract of hemlock or oak bark, which keep in a warm place and strengthen every few days by fresh additions of bark extract, until it is found on cutting a trial slip of the skin that it has been tanned through. The more the skin is handled—taken out, rolled and rubbed, and put in again—the quicker and more uniform the tanning operation proceeds. Anything that tends to force the tannin into the skin hastens the reaction termed tanning.

(38) A. D. P. writes; I have occasion to make casts or moulds of plaster of paris from metal types, but am troubled with air bubbles, or picks as they are sometimes called. What can I do to avoid them? A. In the first place use the finest and purest plaster of Paris obtainable. When filling a mould, learn to beat up the requisite quantity of cream quickly, and with care to avoid making it too thick. In pouring this in, use a good camel's hair brush to displace air bubbles; a mere surface cover of this thin cream is all that is requisite. While doing this have ready the thicker plaster, of the consistence of light sirup, and fill up the mould at once. In about twenty minutes you can open the mould, if your plaster is pure and has been properly mixed. If you do not put too much oil on the type and have used your brush properly, you will find clear, sharp moulds.

(39) E. T. S. asks: 1. Can the gas (hydrogen) generated by immersing scrap zinc in acidulated water be ignited? A. If by "ignited" you mean inflamed, yes; it burns very readily in the air. 2. I have a small electric motor which I wished to convert into a generator of electricity; have made all connections as stated in SUPPLEMENT, No. 161, for making small dynamo, and although the armature revolved at a high rate, could get no current? Can you suggest where my mistake lies? A. There may be some defect in the machine or its connections. We are unable to judge from your brief statements. Attach the terminal wires to a galvanometer to ascertain if any current is developed. If not, put a battery in circuit, including galvanometer and machine. If no current passes, there is a break in the coils or a bad connection. If, on the contrary, the current passes while none is developed on operating the machine with no battery in circuit, it is very probable that the armature coils are short circuited, or cut out by a cross contact, supposing the machine to be properly constructed in all other respects. 3. Will you please state what chemicals are used to make oil and water unite? Usually caustic soda or caustic potash. Consult some elementary work on chemistry.

(40) J. T. E. writes: I wish to know what is best to use to take printer's ink out of silk without damaging the goods? A. Put the stained parts of the fabric into a quantity of benzine, then use a fine, rather stiff brush, with fresh benzine. Dry and rub bright with warm water and curd soap. The benzine will not injure the fabric or dye.

(41) J. Mc D. asks: 1. What is the amount of sulphuric acid per gallon of water generally used in removing scale from cast or wrought iron? A. About 10 per cent. 2. How can I cleanse a cask that has contained vinegar for several years, so that it can be used for other purposes? Can it be done by slaking lime in the cask, and allowing the lime water to remain in it some time? Have been informed that coal oil barrels are sometimes cleansed in that way? A. Old vinegar barrels become impregnated to such an extent with their acetous substances that it is next to impossible to render them fit for the storage of any other liquid. Fill the barrels with milk of lime, and let this remain in them for several months, then rinse out well with plenty of warm water, and steam them inside for half hour.

(42) H. H. C. writes. There is a "remedy for dypsomania" put upon the market here and extensively sold as a "solution of the double chloride of gold." It is very costly, some $9.00 per bottle, and chemists East, to whom specimens have been sent, declare that there is no gold in it. Will you please suggest a test for gold in this state (or in any combination) that could be used by a person tolerably well skilled in pharmacy, but who lays no claim to being an analytic chemist, and which would indicate to a certainty the presence or absence of the metal? A. On a clean porcelain plate put a drop each of pure hydrochloric acid and of the solution to be tested; mix them together and drop into the mixture a small crystal of pure stannous chloride. If gold is present, a dark, purplish color will at once be developed. Repeat with a drop of pure gold chloride for confirmation. The test is very delicate and conclusive.

[OFFICIAL.]

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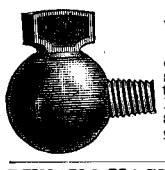

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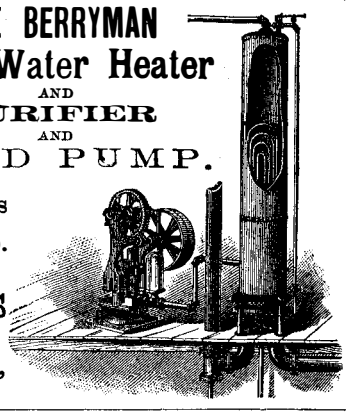

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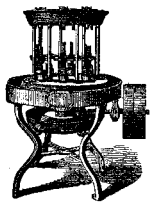

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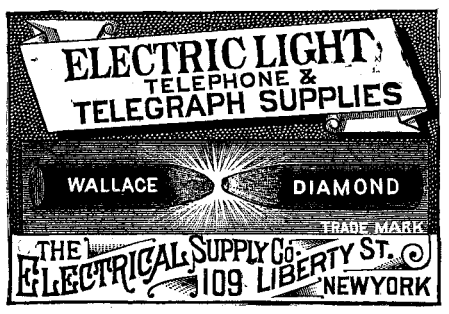

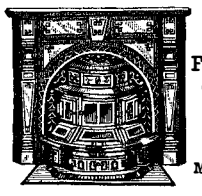

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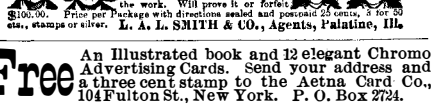

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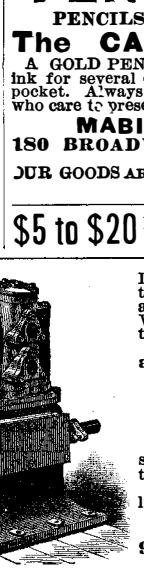

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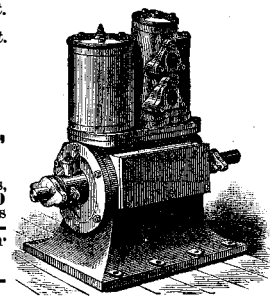

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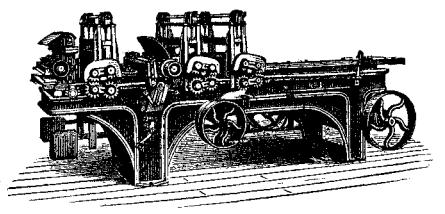

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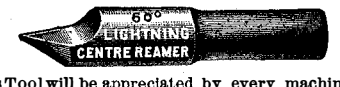

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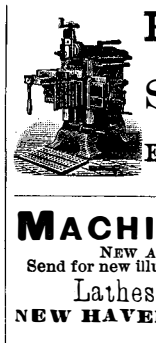

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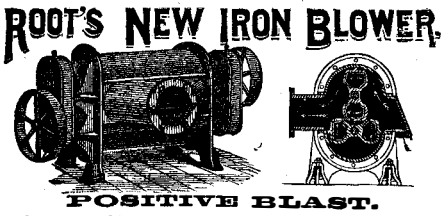

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The approximate amount of dredging is One Million Seven Hundred Thousand cubic yards.

Blank forms on which proposals must be made, specifications, and any desired information can be had on application to this office. PETER C. HAINS,
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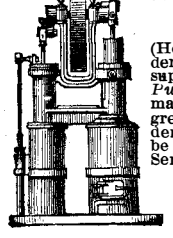

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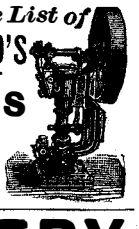

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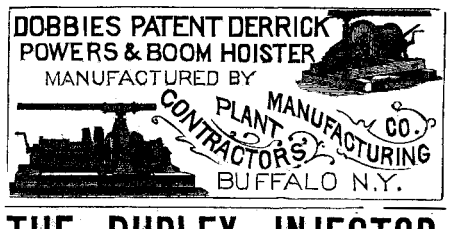

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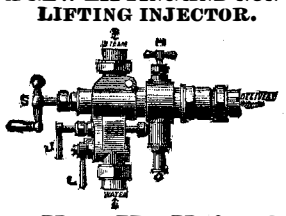

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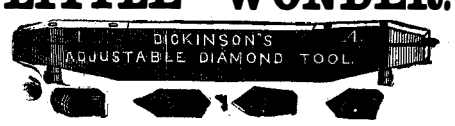

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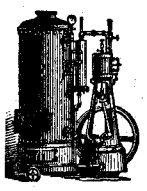

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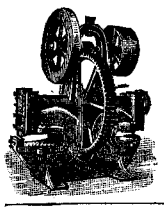

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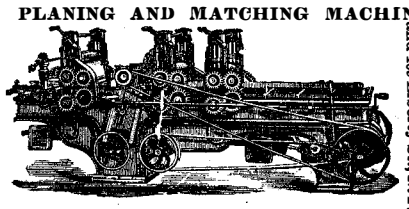

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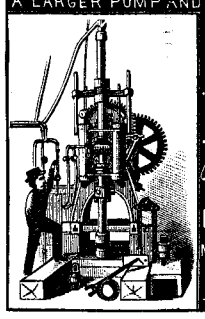

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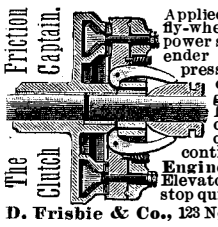

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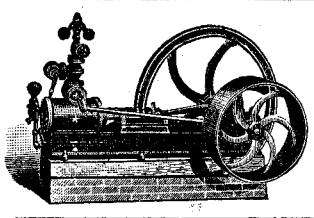

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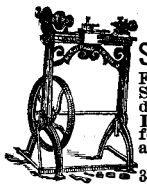

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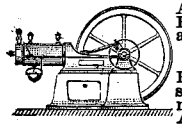

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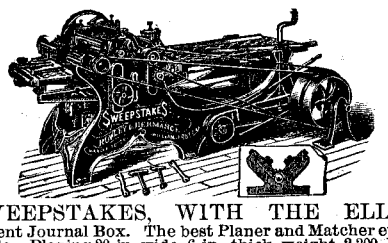

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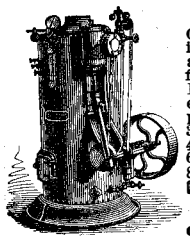

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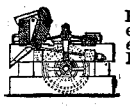

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